Modicon M340 with Unity Pro

CANopen
User Manual

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All pertinent state, regional, and local safety regulations must be observed when installing and using this product. For reasons of safety and to help ensure compliance with documented system data, only the manufacturer should perform repairs to components.

When devices are used for applications with technical safety requirements, the relevant instructions must be followed.

Failure to use Schneider Electric software or approved software with our hardware products may result in injury, harm, or improper operating results.

Failure to observe this information can result in injury or equipment damage.

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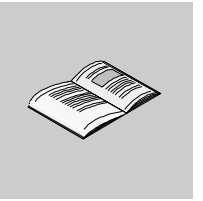

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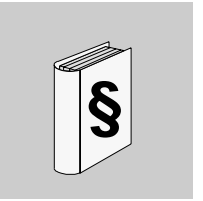
Safety Information



Important Information

NOTICE

Read these instructions carefully, and look at the equipment to become familiar with the device before trying to install, operate, or maintain it. The following special messages may appear throughout this documentation or on the equipment to warn of potential hazards or to call attention to information that clarifies or simplifies a procedure.

The addition of this symbol to a Danger safety label indicates that an electrical hazard exists, which will result in personal injury if the instructions are not followed.

This is the safety alert symbol. It is used to alert you to potential personal injury hazards. Obey all safety messages that follow this symbol to avoid possible injury or death.

⚠ DANGER

DANGER indicates an imminently hazardous situation which, if not avoided, **will result in** death or serious injury.

⚠ WARNING

WARNING indicates a potentially hazardous situation which, if not avoided, **can result in** death or serious injury.

⚠ CAUTION

CAUTION indicates a potentially hazardous situation which, if not avoided, **can result in** minor or moderate injury.

NOTICE

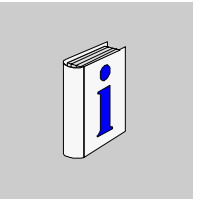
NOTICE is used to address practices not related to physical injury.

PLEASE NOTE

Electrical equipment should be installed, operated, serviced, and maintained only by qualified personnel. No responsibility is assumed by Schneider Electric for any consequences arising out of the use of this material.

A qualified person is one who has skills and knowledge related to the construction and operation of electrical equipment and its installation, and has received safety training to recognize and avoid the hazards involved.

About the Book



At a Glance

Document Scope

This manual describes the implementation of a CANopen network on PLCs of the Modicon M340 range.

NOTE: Regarding Safety considerations, “Emergency objects” and “Fatal error” are mentioned in this manual in conformance with the definition from the DS301 document of the CiA (CAN in Automation).

Validity Note

This documentation is valid from Unity Pro v7.0.

Product Related Information

⚠ WARNING

UNINTENDED EQUIPMENT OPERATION

The application of this product requires expertise in the design and programming of control systems. Only persons with such expertise should be allowed to program, install, alter, and apply this product.

Follow all local and national safety codes and standards.

Failure to follow these instructions can result in death, serious injury, or equipment damage.

User Comments

We welcome your comments about this document. You can reach us by e-mail at techcomm@schneider-electric.com.

CANopen Hardware Implementation

I

Subject of this Part

This part describes the various hardware configuration possibilities of a CANopen bus architecture.

What Is in This Part?

This part contains the following chapters:

Chapter	Chapter Name	Page
1	Hardware Implementation of BMX P34 Processors	13
2	Presentation of CANopen devices	21

Hardware Implementation of BMX P34 Processors

1

Aim of this Chapter

This chapter presents BMX P34 processors equipped with a CANopen port as well as their implementation.

To see the differences between the CPU P34 201/2030 and 20102/20302, please refer to the chapter CANopen Compatibility Restrictions *(see page 137)*.

What Is in This Chapter?

This chapter contains the following topics:

Topic	Page
Description of Processors: BMX P34 2010/20102/2030/20302	14
Modicon M340H (Hardened) Equipment	15
Installation	16
Visual Diagnostics of CANopen Processors	17

Description of Processors: BMX P34 2010/20102/2030/20302

At a Glance

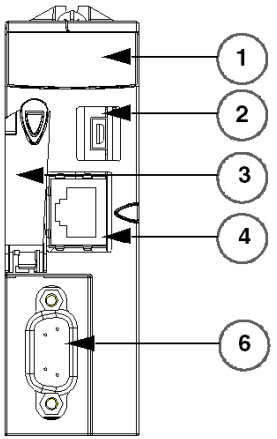
Each PLC station is equipped with a BMX P34 ••••• processor.

There are five processors in the Modicon M340 range that have a CANopen port:

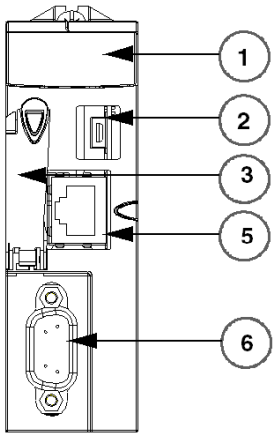
- The BMX P34 2010/20102, which also has a USB port and serial port,
- The BMX P34 2030/20302/20302H *(see page 15)*, which also has a USB port and Ethernet port.

BMX P34 ••••• processors have a simple design, and include a memory card slot.

The following figures present the front sides of the BMX P34 2010 and BMX P34 2030:



BMX P34 2010



BMX P34 2030

Number	Designation
1	Display panel
2	USB Port.
3	SD-Card slot
4	SerialPort
5	Ethernet Port
6	CANopen Port

These processors are bus masters; they cannot function as slaves. They are linked by SUB-D 9 connector points and allow the connection of slave devices which support the CANopen protocol.

NOTE: There is only one BMX P34 ••••• master by bus.

Modicon M340H (Hardened) Equipment

M340H

The Modicon M340H (hardened) equipment is a ruggedized version of M340 equipment. It can be used at extended temperatures (-25...70ºC) (-13...158ºF) and in harsh chemical environments.

This treatment increases the isolation capability of the circuit boards and their resistance to:

- condensation
- dusty atmospheres (conducting foreign particles)
- chemical corrosion, in particular during use in sulphurous atmospheres (oil, refinery, purification plant and so on) or atmospheres containing halogens (chlorine and so on)

The M340H equipment, when within the standard temperature range (0...60ºC) (32...140ºF), has the same performance characteristics as the standard M340 equipment.

At the temperature extremes (-25... 0ºC and 60... 70ºC) (-13...32ºF) and (140...158ºF) the hardened versions can have reduced power ratings that impact power calculations for Unity Pro applications.

If this equipment is operated outside the -25...70ºC (-13...158ºF) temperature range, the equipment can operate abnormally.

⚠ CAUTION
UNINTENDED EQUIPMENT OPERATION Do not operate M340H equipment outside of its specified temperature range. **Failure to follow these instructions can result in injury or equipment damage.**

Hardened equipment has a conformal coating applied to its electronic boards. This protection, when associated with appropriate installation and maintenance, allows it to be more robust when operating in harsh chemical environments.

Installation

At a Glance

BMX P34 2010/20102 2030/20302 processors equipped with a CANopen port are mounted on BMX XBP •••• racks fed by BMX CPS •••• modules.

NOTE: After an extract/insert of the processor while running, the bus is no longer operational. In order to restart the bus, the power supply must be re-initialized.

CANopen Connectors

The CANopen processor port is equipped with a SUB-D9 connection.

The following figure represents the CANopen connector for modules (male) and cables (female).

Pin	Signal	Description
1	-	Reserved
2	CAN_L	CAN_L bus line (Low)
3	CAN_GND	CAN mass
4	-	Reserved
5	Reserved	CAN optional protection
6	GND	Optional mass
7	CAN_H	CAN_H bus line (High)
8	-	Reserved
9	Reserved	CAN External Power Supply. (Dedicated to the optocouplers power and transmitters-receivers.) Optional

NOTE: CAN_SHLD and CAN_V+ are not installed on the Modicon M340 range processors. These are reserved connections.

Visual Diagnostics of CANopen Processors

At a Glance

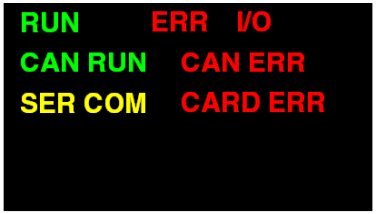
BMX P34 ••••• processors form the Modicon M340 range are equipped with several Module Status visualization LEDs.

BMX P34 2010/20102/2030/20302 processors equipped with a CANopen port have 2 LEDs on their facade that indicate the bus status:

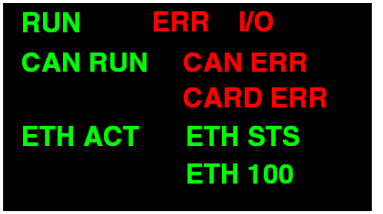
- a green CAN RUN LED,
- a red CAN ERR LED.

In normal operation, the CAN ERR LED is off and the CAN RUN LED is on.

The following figures show the LEDs on the facade of modules:



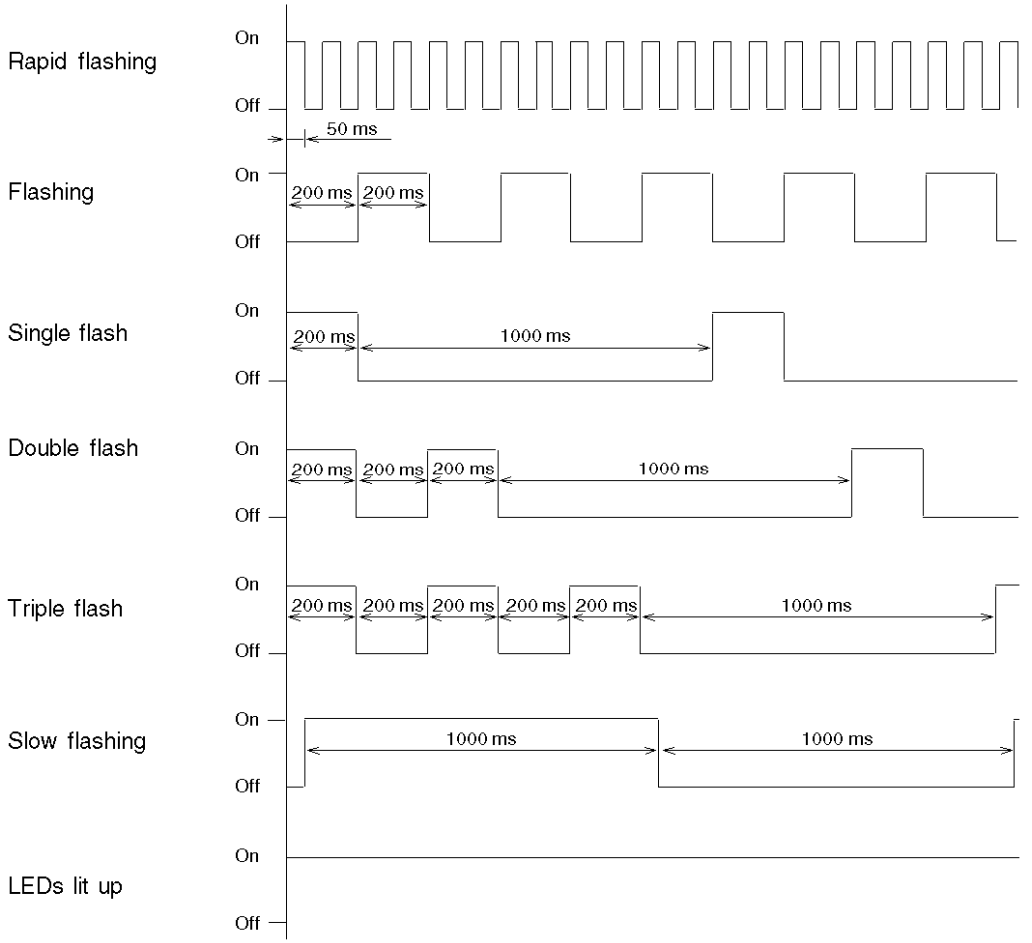
Visualization screen of BMX P34 2010



Visualization screen of BMX P34 2030

LED Status

The following trend diagram represents the possible status of LEDs:



Description

The following table describes the role of CAN RUN and CAN ERR LEDs:

Display LED	On	Flash	Flashing	Off	Slow flashing
CAN RUN (green)	The master is operational.	**SImple**: The master is stopped. **Triple** : Loading of CANopen firmware in process.	The master is pre-operational or initialization in progress.	-	Starting CANopen master self-test.
CAN ERR (red)	Bus stopped. The CAN controller has status "BUS OFF".	The CAN network is disturbed. **Simple** : at least one of the counters has attained or exceeded the alert level. **Double** : Monitoring detected fault (Nodeguarding or Heartbeat)	Invalid configuration, or logic configuration different from physical configuration: missing, different or additional slaves detected.	OK.	An anomaly occured during the CANopen coprocessor start. The CANopen master cannot start. If this state is maintained, you must change the CPU.

Presentation of CANopen devices

2

Subject of this Section

This section presents the different CANopen devices.

What Is in This Chapter?

This chapter contains the following topics:

Topic	Page
CANopen Devices	22
CANopen motion command devices	23
CANopen Input/Output devices	28
Other Devices	31

CANopen Devices

At a Glance

The devices that you can connect to a CANopen bus and that can be configured in Unity Pro are grouped according to their functions:

- motion command devices,
- input/output devices,
- other devices.

NOTE: Only devices from the Hardware Catalog can be used with Unity Pro. New devices have to be imported to the Hardware Catalog from the Hardware Catalog Manager. This import is available since Unity 4.0.

NOTE: An overview of the Hardware Catalog Manager in read only mode is available in Unity Pro through the Hardware Catalog.

Motion Command Devices

Motion command devices enable you to control motors.

These devices are:

- Altivar,
- Lexium,
- IcLA,
- Osicoder,
- Telsys T,
- SD328A Stepper Drive.

Input/Output Devices

Input/Output modules function as remote modules. These devices are:

- Tego Power devices,
- Advantys FTB,
- Advantys OTB,
- Advantys FTM,
- Preventa devices.

Other Devices

These are:

- Advantys islands STB,
- Tesys U,
- Festo Valve Terminal,
- Parker Moduflex.

The STB islands also allow the monitoring of inputs/outputs.

CANopen motion command devices

At a glance

Motion command devices enable you to control motors.

These devices are:
- Altivar,
- Lexium,
- IcLA,
- Osicoder,
- Tesys T,
- SD328A Stepper Drive.

Altivar devices

An Altivar device enables to control the speed of a motor by flux vector control.

The following figure gives an example of an Altivar device:

NOTE: The recommended minimum version of the firmware is V1.3 for ATV31 T.

NOTE: The recommended minimum version of the firmware is V1.1 for ATV31, ATV61 and ATV71.

NOTE: ATV31 V1.7 is not supported. However, it can be used by configuring it with ATV31 1.2 profile. In this case, only the ATV31 V1.2 functions will be available

NOTE: ATV71: if you have to disconnect it from the CANopen bus, power off the device, else, when reconnecting it on the bus, it will provoke a Bus Fatal error. This is fixed with the ATV71 firmware version V1.2 and later.

NOTE: ATV61: if you have to disconnect it from the CANopen bus, power off the device, else, when reconnecting it on the bus, it will provoke a Bus Fatal error. This is fixed with the ATV61 firmware version V1.4 and later.

Lexium devices

The range of Lexium 05 servo drives that are compatible with BSH servo motors constitutes a compact and dynamic combination for machines across a wide power (0,4...6 kW) and power supply voltage range.

The compact design of the Lexium 05 servo drive and the integrated components (line filter, braking resistor and safety function) reduces the space required in the switch cabinet to a minimum. It integrates the Power Removal safety function which prevents accidental starting of the motor.

Another advantage of the servodrive Lexium 05 is the versatile application options:
- as torque or speed controller via the analogue inputs,
- as electronic gearbox via the RS422 interface,
- as positioning or speed controller via the field bus interface.

The servodrive is available in four voltage types:
- 115 VAC single-phase,
- 230 VAC single-phase and 3-phase,
- 400/480 VAC 3-phase.

The following figure gives an example of a Lexium device:

NOTE: The recommended minimum version of the firmware for Lexium 05 MFB device is V1.003

NOTE: The recommended minimum version of the firmware for Lexium 05 device is V1.120.

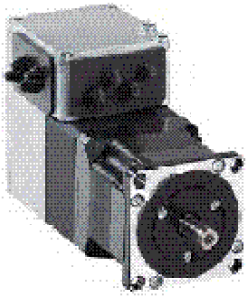
NOTE: The recommended minimum version of the firmware for Lexium 15 LP is V1.45.

NOTE: The recommended minimum version of the firmware for Lexium 15 MH is V6.64.

IcLA devices

IcLA devices are intelligent compact drives. They integrate everything required for motion tasks: positioning controller, power electronics and servo, EC or stepper motor.

The following figure gives an example of an IcLA device:



⚠ WARNING

UNINTENDED EQUIPMENT OPERATION

Use ICLA IFA devices with minimum firmware version V1.105.

Use ICLA IFE devices with minimum firmware version V1.104.

Use ICLA IFS devices with minimum firmware version V1.107.

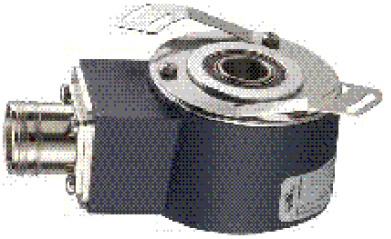
Failure to follow these instructions can result in death, serious injury, or equipment damage.

Osicoder devices

The Osicoder device is an angular position sensor.

Mechanically coupled to a driving spindle of a machine, the shaft of the encoder rotates a disc that comprises a succession of opaque and transparent sectors. Light from leds passes through the transparent sectors of the disc as they appear and is detected by photosensitive diodes. The photosensitive diodes, in turn, generate an electrical signal which is amplified and converted into a digital signal before being transmitted to a processing system or an electronic variable speed drive. The electrical output of the encoder therefore represents, in digital form, the angular position of the input shaft.

The following figure gives an example of an Osicoder device:



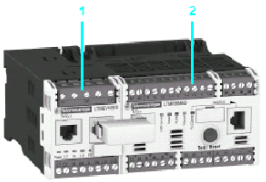
NOTE: The minimum version of the firmware for Osicoder devices is V1.0.

Tesys T Motor Management System

Tesys T is a motor management system that provides overload detection, metering and monitoring functions for single-phase and 3-phase, constant speed, a.c. motors up to 810 A.

Using Tesys T in a motor control panels makes it possible to:
- Increase the operational availability of installations,
- improve flexibility from project design through to implementation,
- increase productivity by making available all information needed to run the system.

The following figure gives an example of a Tesys T device:



1 LTM EV40BD extension module
2 LTM R08MBD controller

SD328A Stepper Drive

The SD328A is a universally applicable stepper drive.

It offers a very compact and powerful drive system in combination with selected stepper motors by Schneider Electric Motion.

The device has an output for direct connection of an optional holding brake.

The following figure gives an example of a SD328A Stepper Drive device:

CANopen Input/Output devices

At a glance

The Input/Output modules function as remote modules.

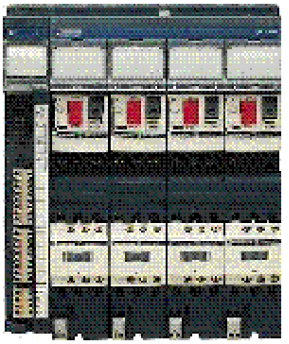
These devices are:

- Tego Power devices,
- Advantys FTB,
- Advantys OTB,
- Advantys FTM,
- Preventa devices.

Tego Power devices

Tego Power is a modular system which standardizes and simplifies the implementation of motor starters with its pre-wired control and power circuits. In addition, this system enables the motor starter to be customized at a later date, reduces maintenance time and optimizes panel space by reducing the number of terminals and intermediate interfaces and also the amount of ducting.

The following figure gives an example of a Tego Power device:



NOTE: The minimum version for TegoPower APP_1CCO0 and TegoPower APP_1CCO2 is V1.0

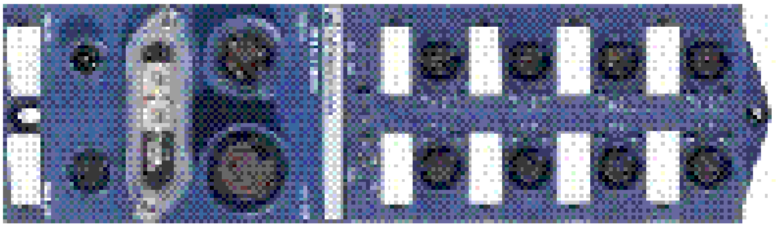
Advantys FTB devices

The Advantys FTB dispatcher is composed of several input/outputs that allow sensors and activators to be connected.

NOTE: The minimum firmware version for FTB is V1.07

NOTE: For FTB 1CN16CM0, operating is guaranteed from the minimum firmware version V1.05

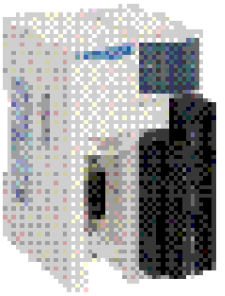
The following figure gives an example of an Advantys FTB device:



Advantys OTB devices

An Advantys OTB device enables you to constitute discrete input/output islands (max.132 channels in boundaries) or analog (max. 48 channels) IP20 and to connect them close to the active captors.

The following figure gives an example of an Advantys OTB device:



NOTE: The minimum firmware version for OTB is V2.0

⚠ WARNING
UNINTENDED EQUIPMENT OPERATION
Use Advantys OTB devices with minimum firmware version V2.0.
Failure to follow these instructions can result in death, serious injury, or equipment damage.

Advantys FTM CANopen

The Advantys FTM modular system enables you to connect a variable number of input/output splitter boxes, using a single communication interface (field bus module).

These splitter boxes are connected to the module using a hybrid cable which includes the internal bus and power supply (internal, sensor and actuator).

The input/output splitter boxes are independent of the field bus type, thus reducing the number of splitter box references. Once installed, the system is ready to begin operation.

The following figure gives an example of an Advantys FTM CANopen device:

Preventa devices

Preventa devices are electronic safety controllers for monitoring safety functions.

The following figure gives an example of a Preventa device:

Other Devices

At a Glance

These devices are:

- STB Island,
- Tesys U,
- Festo Valve Terminal,
- Parker Moduflex.

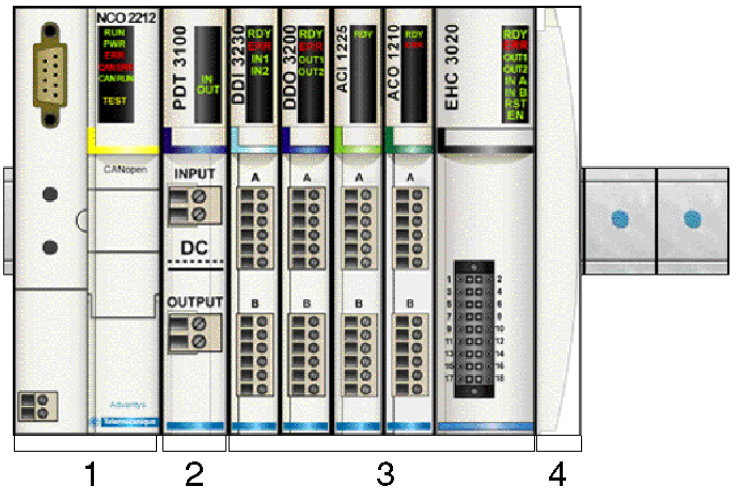
STB Island

An Advantys STB island is composed of several input/output modules.

The modular elements of the island are connected by a CANopen local bus using a network interface module NIM.

STB modules can only be used in an STB island.

The following figure gives an example of an island:



Description:

Number	Designation
1	Network Interface Module.
2	Power supply Distribution Module.
3	Distributed input/output modules. These modules can be: ● digital input/output modules, ● analog input/output modules, ● special purposes.
4	Termination plate of island bus.

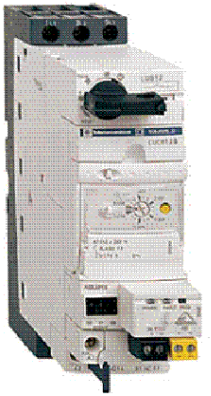
Tesys U Devices

TeSys U-Line motor starters provide motor control for choices ranging from a basic motor starter with solid-state thermal overload protection to a sophisticated motor controller which communicates on networks and includes programmable motor protection.

This device performs the following functions:

- Protection and control of 1-phase or 3-phase motors:
  - Isolation breaking function
  - Electronic short-circuit protection
  - Electronic overload protection
  - Power switching
- Control of the application:
  - Status (protection functions, e.g. overload pending)
  - Status monitoring (running, ready, ...)
  - Application monitoring (running time, number of anomalies, motor current values)
  - Detected fault logging (last 5 anomalies saved, together with motor parameter values).

The following figure gives an example of a Tesys U device:



Festo valve terminal

CPV Direct:

CPV valves are series manifold valves, in addition to the valve function they contain all of the pneumatic ducts for supply, exhaust and the working lines.

The supply ducts are a central component of the valve slices and allow a direct flow of air through the valve slices. This helps achieve maximum flow rates. All valves have a pneumatic pilot control for optimising performance.

The fieldbus node is directly integrated in the electrical interface of the valve terminal and therefore takes up only a minimal amount of space.

The optional string extension allows an additional valve terminal and I/O modules to be connected to the Fieldbus Direct fieldbus node.

The CPV valve terminal is available in three sizes:

- CPV10
- CPV14
- CPV18

The following figure gives an example of a Festo valve terminal device:

CPX Terminal:

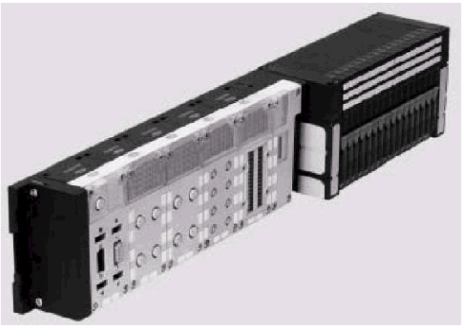
The electrical terminal CPX is a modular peripheral system for valve terminals. The system is specifically designed so that the valve terminal can be adapted to suit different applications.

Variable connection options for the valve terminal pneumatic components (MPA/CPA/VTSA)

Flexible electrical connection technology for sensors and actuators

The CPX terminal can also be used without valves as a remote I/O system.

The following figure gives an example of a CPX terminal device:



Parker Moduflex

Parker Moduflex Valve System provides flexible pneumatic automation.

Depending on application, you can assemble short or long islands (up to 16 outputs). IP 65-67 water and dust protection allows the valve to be installed near the cylinders for shorter response time and lower air consumption. The Parker Moduflex Valve System CANopen module (P2M2HBVC11600) can be used as an enhanced CANopen device in an Modicon M340 configuration.

The firmware version of the P2M2HBVC11600 must be V 1.4 or later.

For detailed descriptions of P2M2HBVC11600 wiring, LED patterns, set-up procedures, and functionality, refer to user documentation provided by Parker.

"S" Series Stand-Alone Valves:

For isolated cylinders on a machine, it is preferable to locate the valve close by. Therefore a stand-alone module is ideal, response time and air consumption are then reduced to a minimum. Peripheral modules can be installed directly into the valve.

The following figure gives an example of a "S" Series Single Solenoid device:

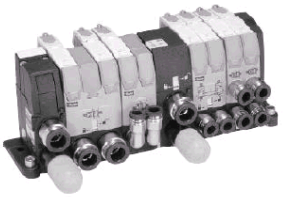
The following figure gives an example of a "S" Series Single Air Pilot device:

"T" Series Valve Island Modules

For small groups of cylinders requiring short localized valve islands.

Modules with different functions and flow passages may be combined in the same island manifold, giving total flexibility to adapt to all machine requirements.

The following figure gives an example of a "T" Series Valve Island Module device:



Software Implementation of CANopen Communication

II

Subject of this Part

This part describes the various possibilities for software configuration, programming and diagnostics in a CANopen application.

What Is in This Part?

This part contains the following chapters:

Chapter	Chapter Name	Page
3	Generalities	39
4	Configuration of Communication on the CANopen Bus	49
5	Catalog Manager Software Implementation	99
6	Programming	153
7	Debugging Communication on the CANopen Bus	169
8	Diagnostics	177
9	Language Objects	185

Generalities

3

Subject of this Chapter

This chapter describes CANopen software implementation principles on the Modicon M340 bus.

What Is in This Chapter?

This chapter contains the following topics:

Topic	Page
Implementation Principle	40
Implementation Method	41
Performance	42
Device PDO and Memory Allocation	45

Implementation Principle

At a Glance

In order to implement a CANopen bus, it is necessary to define the physical context of the application in which the bus is integrated (rack, supply, processor, modules), and then ensure that the necessary software is implemented.

The software is implemented in two ways with Unity Pro:
- In offline mode
- In online mode

Implementation Principle

The following table shows the different implementation phases:

Mode	Phase	Description
Offline	Configuration	Entry of configuration parameters.
Offline or online	Symbolization	Symbolization of the variables associated with the CANopen port of the **BMX P34 ••••**processor.
	Programming	Programming the specific functions: ● Bit objects or associated words ● Specific instructions
Online	Transfer	Transferring the application to the PLC.
	Debugging Diagnostics	Different resources are available for debugging the application, controlling inputs/outputs and diagnostic messages: ● Language objects or IODDTs ● The Unity Pro debugging screen ● Signaling by LED
Offline or online	Documentation	Printing the various information relating to the configuration of the CANopen port.

NOTE: The above order is given for your information. Unity Pro software enables you to use editors in the desired order of interactive manner.

⚠ WARNING

UNINTENDED EQUIPMENT OPERATION

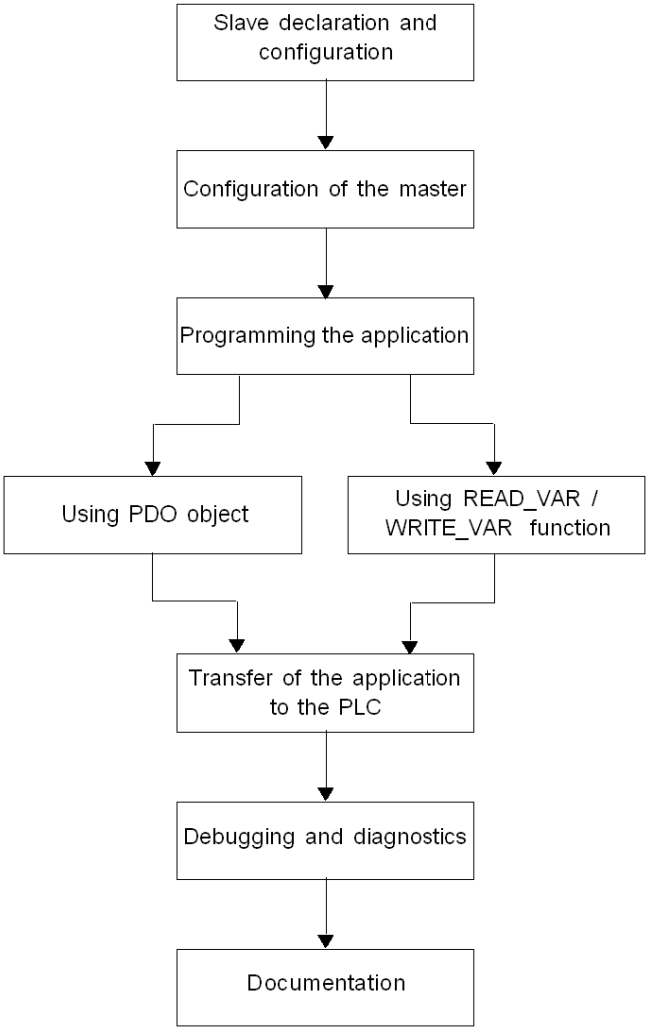
Use diagnosis system information and monitor the response time of the communication. In case of disturbed communication, the response time can be too high.

Failure to follow these instructions can result in death, serious injury, or equipment damage.

Implementation Method

Overview

The following flowchart shows the CANopen port implementation method for BMX P34 •••• processors:



Performance

Introduction

Various CANopen performances are detailed below.

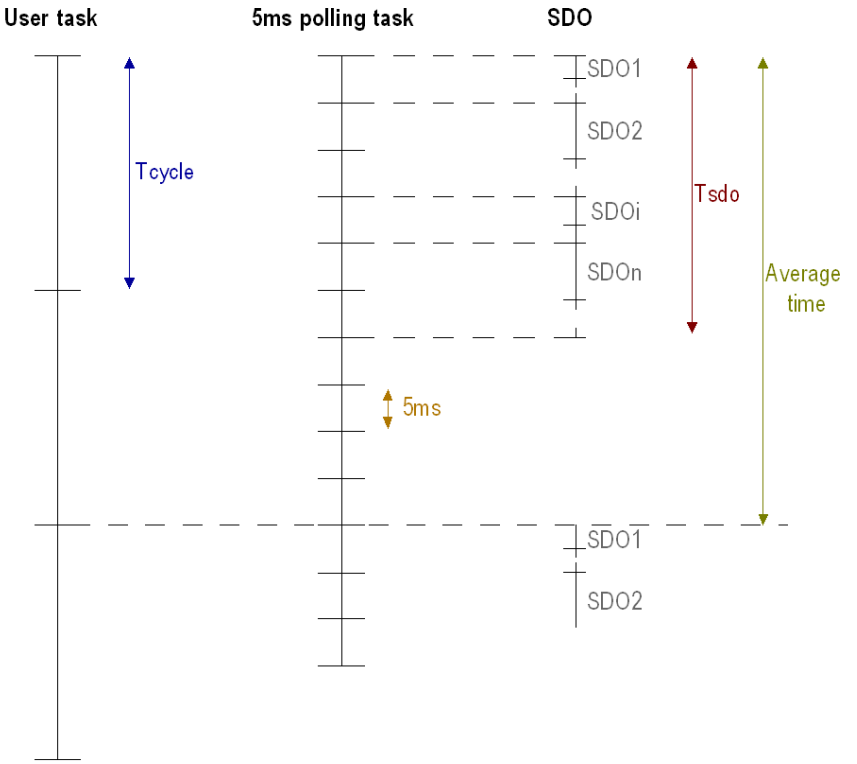
Impact on Task Cycle Time

The time given to each task cycle is as follows:

Task	Typical
CANopen inputs	10 µs / PDO
CANopen outputs	80 µs + 15 µs / PDO
Diagnostics	120 µs

Communication by SDO

The following figure gives an overview of the SDO management:



The following table defines the terms that are used to describes the 'Communication by SDO' graphic:

Term	Definition
Tcycle	User task cycle
n	Number of SDO to execute in parallel
Tsdo	Time to process the n SDOs (multiple of 5 ms due to the polling task)
Average time	Average time to execute all the SDO from SDO1 to SDOn. The average time depends on the Tcycle, n and Tsdo: ● If Tcycle > Tsdo then Average time=Tcycle ● If Tcycle < Tsdo then Average time=NB * Tcycle and NB=Tsdo/(Tcycle+1)

NOTE: A polling task runs every 5 ms and at each task cycle in order to check the end of the exchange.This is useful if the user runs many SDOs.

Example: for a task cycle of 50 ms, a number of 10 SDOs/Mast Cycle and a SDO exchange time of 3 ms.

With the polling task, you can treat 2 SDOs/5ms. In order to do that, these SDOs must be addressed to two different devices.

Therefore, we can launch 10 SDOs/task cycle.

Bus Start

The CANopen bus start time depends on the number of devices.

The minimum time to start a CANopen bus is 7 seconds.

The time to configure one device is about 0.8 second.

The start time of a CANopen bus with 64 devices is about 1 minute.

Disconnection/Reconnection of a Device

Disconnection:

The time to detect the disconnection of a device depends on the error control:

Error control	Description
Guardtime	The time to detect the disconnection is **Guardtime * life time factor**
Heartbeat	The time to detect the disconnection is **Heartbeat producer time + (Heartbeat producer time /2)**

Reconnection:

Each second, the master polls on the device to check the reconnection of the device. The time to reconnect the device is about 1 second if the device is not alone on the bus.

If the device is alone on the bus, the disconnection of the device set the master in the same case as the disconnection of the complete bus. After this state, the master restarts the bus and the reconnection time of the device is about 7 seconds.

Device PDO and Memory Allocation

At a glance

The following table describes limits for each device and therefore specifies the maximum configuration of the application:

Familly	Device	F*	Tx PDO	Rx PDO	Tx Cob Id	Rx Cob Id	Extra Cob Id	%MW IN	%MW OUT	%M IN	%M OUT
Motor Control	APP_1CC00		5	5	4	4	2	4	2	0	0
	APP_1CC02		5	5	4	4	2	8	6	0	0
	TeSysT_MMC_L		4	4	4	4	0	46	8	0	0
	TeSysT_MMC_L_EV40		4	4	4	4	0	62	12	0	0
	TeSysT_MMC_R		4	4	4	4	0	46	8	0	0
	TeSysT_MMC_R_EV40		4	4	4	4	0	62	12	0	0
	TeSysU_C_Ad		4	4	4	4	0	16	8	0	0
	TeSysU_C_Mu_L		4	4	4	4	0	50	10	0	0
	TeSysU_C_Mu_R		4	4	4	4	0	38	12	0	0
	TeSysU_Sc_Ad		4	4	4	4	0	14	10	0	0
	TeSysU_Sc_Mu_L		4	4	4	4	0	48	10	0	0
	TeSysU_Sc_Mu_R		4	4	4	4	0	36	12	0	0
	TeSysU_Sc_St		4	4	4	4	0	14	10	0	0
Detection	Osicoder		2	0	2	0	0	2	0	0	0
Distributed I/O	FTB_1CN08E08CMO		2	2	2	2	0	2	0	40	8
	FTB_1CN08E08SP0		2	2	2	2	0	2	0	0	8

Familly	Device	F*	Tx PDO	Rx PDO	Tx Cob Id	Rx Cob Id	Extra Cob Id	%MW IN	%MW OUT	%M IN	%M OUT
	FTB_1CN12E04SP0		2	2	2	2	0	2	0	28	4
	FTB_1CN16CM0		2	2	2	2	0	2	0	56	16
	FTB_1CN16CP0		2	2	2	2	0	2	0	56	16
	FTB_1CN16EM0		2	2	2	2	0	2	0	24	0
	FTB_1CN16EP0		2	2	2	2	0	2	0	24	0
	FTM_1CN10		5	5	4	4	2	54	50	0	0
	OTB Island	Sta	8	8	4	4	8	68	20	0	0
		Ext	6	8	4	4	6	102	54	0	0
	OTB_1C0_DM9LP		8	8	4	4	8	38	10	0	0
	STB_NCO_1010	Sim	32	32	4	4	56	132	96	0	0
		Ext	32	32	4	4	56	228	192	0	0
	STB_NCO_2212	Sim	32	32	4	4	56	132	96	0	0
		Ext	32	32	4	4	56	228	192	0	0
		Adv	32	32	4	4	56	278	244	0	0
		Lar	32	32	4	4	56	694	484	0	0
Motion & Drives	ATV31_V1_1	Bas	2	2	2	2	0	4	4	0	0
		Sta	2	2	2	2	0	6	10	0	0
		Ext	2	2	2	2	0	20	16	0	0
	ATV31_V1_2	Bas	2	2	2	2	0	4	4	0	0
		Sta	2	2	2	2	0	6	10	0	0
		Ext	2	2	2	2	0	20	16	0	0
		MFB	2	2	2	2	0	2	2	0	0
	ATV31_V1_7	Bas	2	2	2	2	0	4	4	0	0
		Sta	2	2	2	2	0	6	10	0	0
		Ext	2	2	2	2	0	20	16	0	0

Familly	Device	F*	Tx PDO	Rx PDO	Tx Cob Id	Rx Cob Id	Extra Cob Id	%MW IN	%MW OUT	%M IN	%M OUT
	ATV31T_V1_3	Bas	2	2	2	2	0	4	4	0	0
		Sta	2	2	2	2	0	6	10	0	0
		Ext	2	2	2	2	0	20	16	0	0
	ATV61_V1_1	Bas	3	3	3	3	0	8	8	0	0
		Sta	3	3	3	3	0	32	20	0	0
		Ext	3	3	3	3	0	70	62	0	0
		Con	3	3	3	3	0	76	62	0	0
	ATV71_V1_1	Bas	3	3	3	3	0	8	8	0	0
		Sta	3	3	3	3	0	16	10	0	0
		Ext	3	3	3	3	0	22	14	0	0
		Con	3	3	3	3	0	80	58	0	0
		MFB	3	3	3	3	0	6	6	0	0
	IclA_IFA	Def	1	1	1	1	0	8	10	0	0
		MFB	1	1	1	1	0	6	6	0	0
	IclA_IFE	Def	1	1	1	1	0	8	10	0	0
		MFB	1	1	1	1	0	6	6	0	0
	IclA_IFS	Def	1	1	1	1	0	8	10	0	0
		MFB	1	1	1	1	0	6	6	0	0
	LXM05_MFB		4	4	4	4	0	10	10	0	0
	LXM05_V1_12		4	4	4	4	0	24	26	0	0
	LXM15LP_V1_45		4	4	4	4	0	8	10	0	0
	LXM15MH_V6_64	Def	4	4	4	4	0	96	134	0	0
		MFB	4	4	4	4	0	8	10	0	0
	SD3_28		4	4	4	4	0	22	20	0	0
Safety	XPSMC16ZC		4	0	4	0	0	28	0	0	0
	XPSMC32ZC		4	0	4	0	0	28	0	0	0

Familly	Device	F*	Tx PDO	Rx PDO	Tx Cob Id	Rx Cob Id	Extra Cob Id	%MW IN	%MW OUT	%M IN	%M OUT
Third-party devices	CPV_C02	Bas	1	1	1	1	0	8	4	0	0
		Adv	1	1	1	1	0	10	6	0	0
		CpEx	1	1	1	1	0	10	4	0	0
	CPX_FB14	BDIO	4	4	4	4	0	56	50	0	0
		GDIO	4	4	4	4	0	26	20	0	0
		Adv	4	4	4	4	0	72	66	0	0
	P2M2HBVC11600		1	1	1	1	0	2	2	0	0

Legend for F*	
Ext	Extended
Sta	Standard
Sim	Simple
Lar	Large
Bas	Basic
MFB	MFB
Con	Controler
Def	Default
Adv	Advanced
CpEx	CP Extension
BDIO	Basic DIO only
GDIO	Generic DIO AIO

F* : Function

Configuration of Communication on the CANopen Bus

4

Aim of this Chapter

This chapter presents the configuration of the CANopen field bus and of the bus master and slaves.

What Is in This Chapter?

This chapter contains the following sections:

Section	Topic	Page
4.1	General Points	50
4.2	Bus Configuration	51
4.3	Device Configuration	61
4.4	Master Configuration	85

4.1 General Points

Generalities

Introduction

Configuration of a CANopen architecture is integrated into Unity Pro.

When the channel of the CANopen master has been configured, a node is automatically created in the project browser. It is then possible to launch Bus Editor from this node in order to define the topology of the bus and configure the CANopen elements.

NOTE: You cannot modify the configuration of the CANopen bus in connected mode.

4.2 Bus Configuration

Subject of this Section

This section presents the configuration of the CANopen bus.

What Is in This Section?

This section contains the following topics:

Topic	Page
How to Access the CANopen Bus Configuration Screen	52
CANopen Bus Editor	54
How to Add a Device on the Bus	56
How to Delete/Move/Duplicate a Bus Device	58
View CANopen Bus in the Project Browser	60

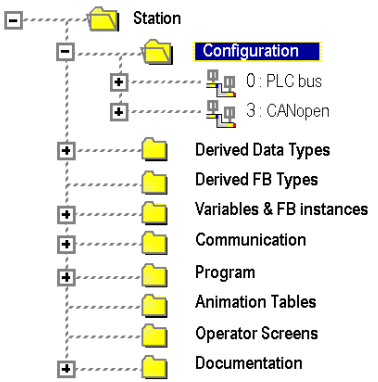
How to Access the CANopen Bus Configuration Screen

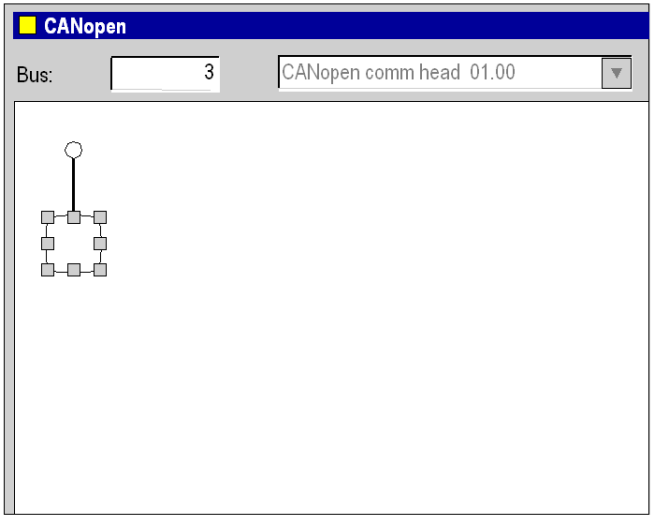
At a Glance

This describes how to access the configuration screen of the CANopen bus for a Modicon M340 PLC with a built-in CANopen link.

Procedure

To access the CANopen field bus, perform the following actions:

Step	Action
1	From the project navigator, deploy the **Configuration** directory. **Result**: the following screen appears: 

Step	Action
2	To open the CANopen bus screen, select one of the following methods: ● double-click on the CANopen directory, ● select the CANopen sub-directory and select **Open**in the contextual menu. **Result**: the **CANopen** window appears: 

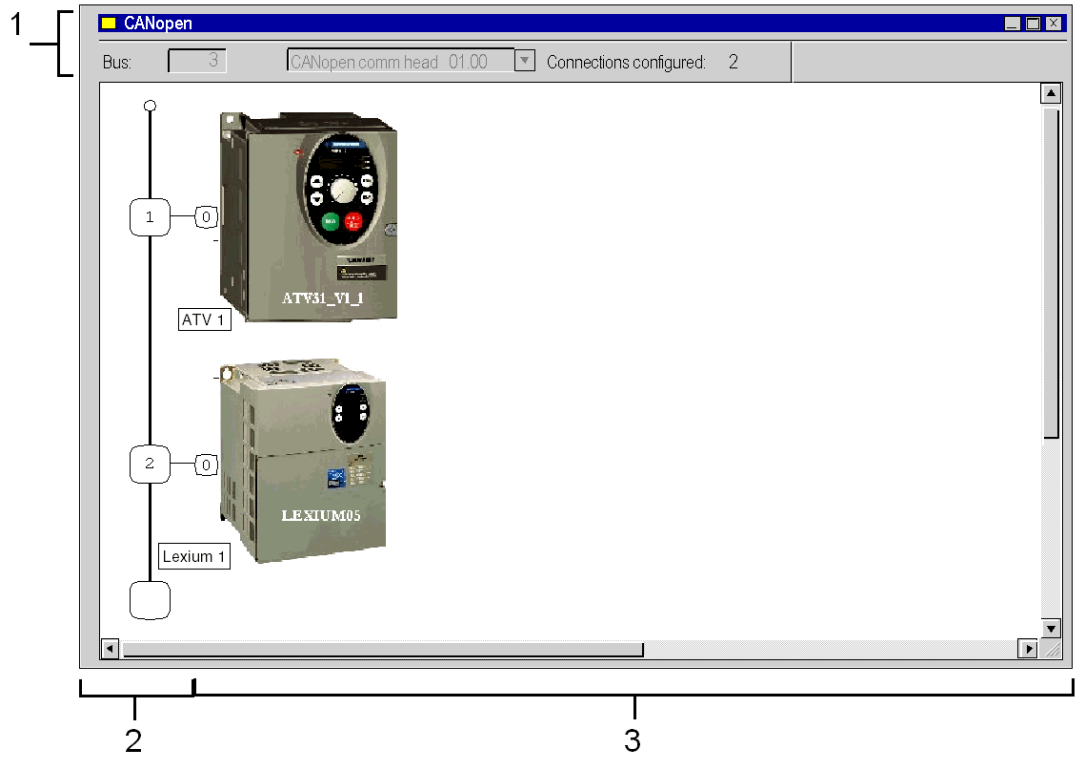
CANopen Bus Editor

At a Glance

This screen is used to declare devices which are connected to the bus.

Illustration

The CANopen bus editor looks like this:



Elements and Functions

This table describes the different areas that make up the configuration screen:

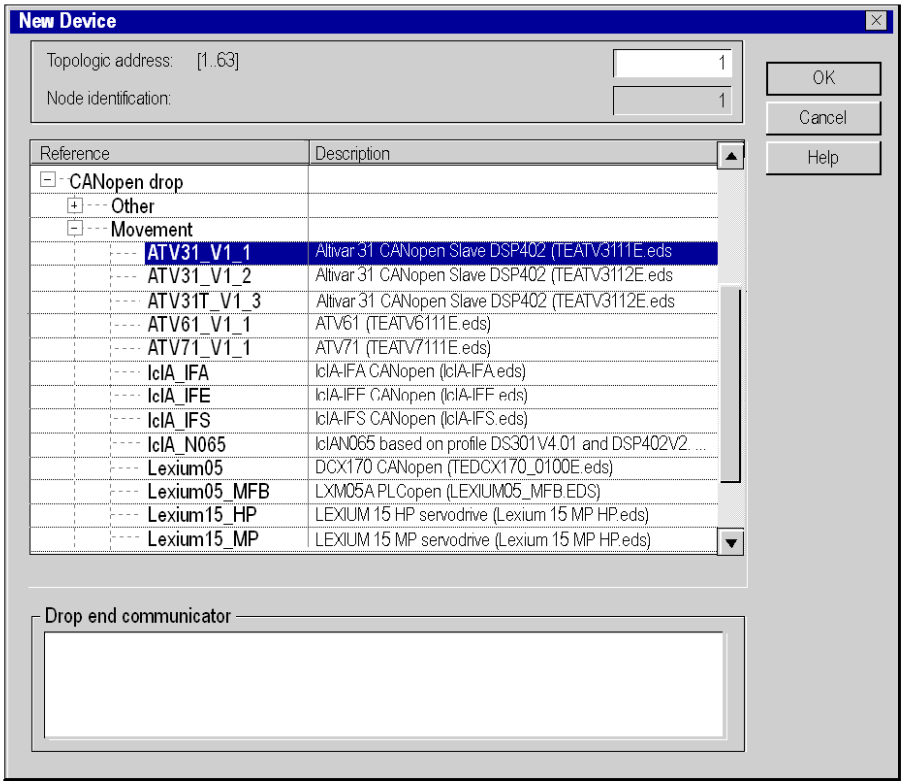
Number	Element	Function
1	Bus	Bus number.
	Connections configured	Indicates the number of connection points configured.
2	Logical address area	This area includes the addresses of the devices connected to the bus.
3	Module area	This area includes the devices that are connected to the bus.

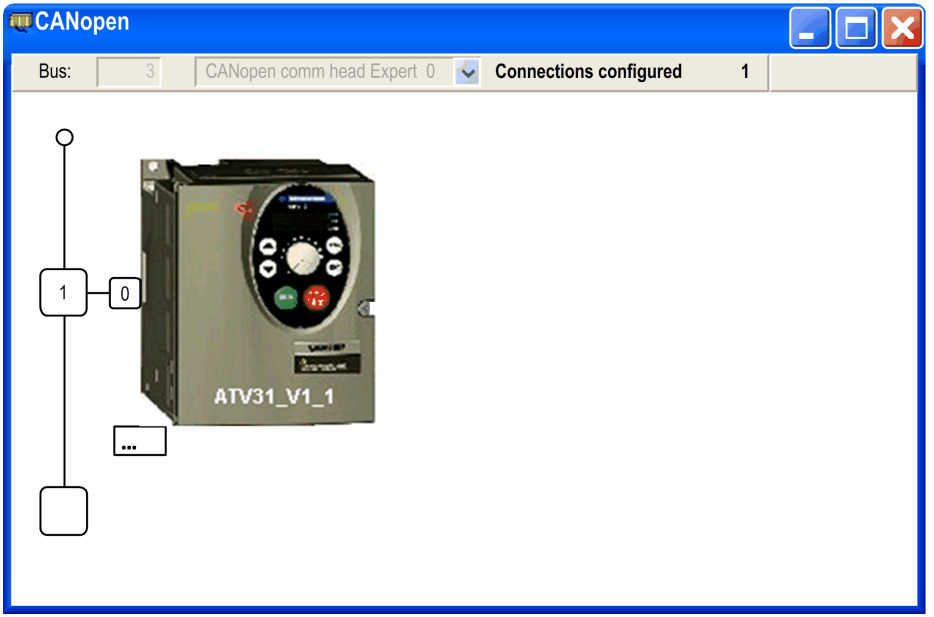
Available connection points are indicated by an empty white square.

How to Add a Device on the Bus

Procedure

This operation is used to add, via the software, a device connected to the CANopen bus:

Step	Action
1	Access the CANopen *(see page 52)* configuration screen.
2	Double-click on the place where the module should be connected. **Result**: the **New Device** screen appears. 
3	Enter the number of the connection point corresponding to the address. By default, the Unity Pro software offers the first free consecutive address.
4	In the **Communicator** field, select the element type enabling communication on the CANopen bus. For modules with built-in communicators, this window does not appear.

Step	Action
5	Validate with **Ok**. **Result**: the module is declared. 

How to Delete/Move/Duplicate a Bus Device

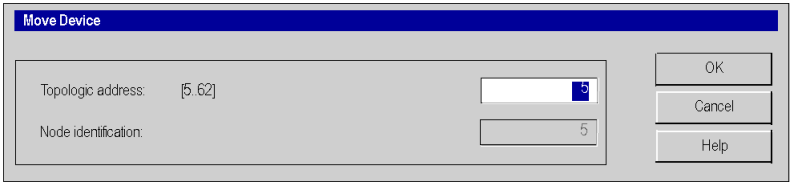
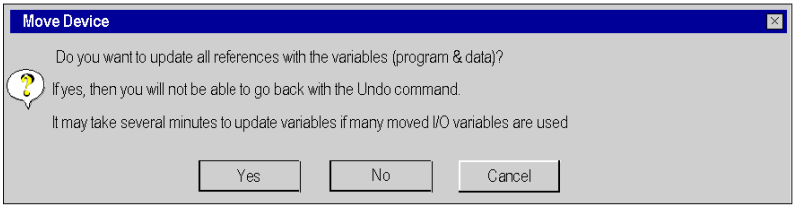
Procedure for Deleting a Device

This operation is used to delete, via the software, a device connected to the CANopen bus:

Step	Action
1	Access the CANopen configuration screen.
2	Right-click on the connection point of the device to be deleted, then click on **Delete the drop**.

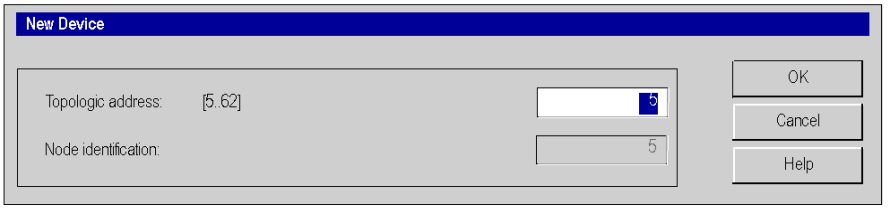
Procedure for Moving a Device

Moving a device does not involve a physical move on the bus, but rather a change in the device address logic. A movement thus triggers modification of the address of inputs/outputs objects in the program and movement of the variables associated with these objects.

Step	Action
1	Access the CANopen configuration screen.
2	Select the connection point to be moved (a frame surrounds the selected connection point).
3	Drag and drop the connection point to be moved to an empty connection point. **Result**: the **Move Device** screen appears: 
4	Enter the number of the destination connection point.
5	Confirm the new connection point by pressing **OK**. **Result**: the **Move Device** screen appears: 
6	Confirm the modification by pressing **Yes** to modify the addresses of the inputs/outputs objects in the program and move the variables associated with these objects.

Procedure for Duplicating a Device

This feature is similar to the function for moving a device:

Step	Action
1	Access the CANopen configuration screen.
2	Right-click on the device to be copied, then click on **Copy**.
3	Right-click on the connection point desired, then click on **Paste**. **Result**: the **New Device** screen appears: 
4	Enter the number of the destination connection point.
5	Confirm the new connection point by pressing **OK**.

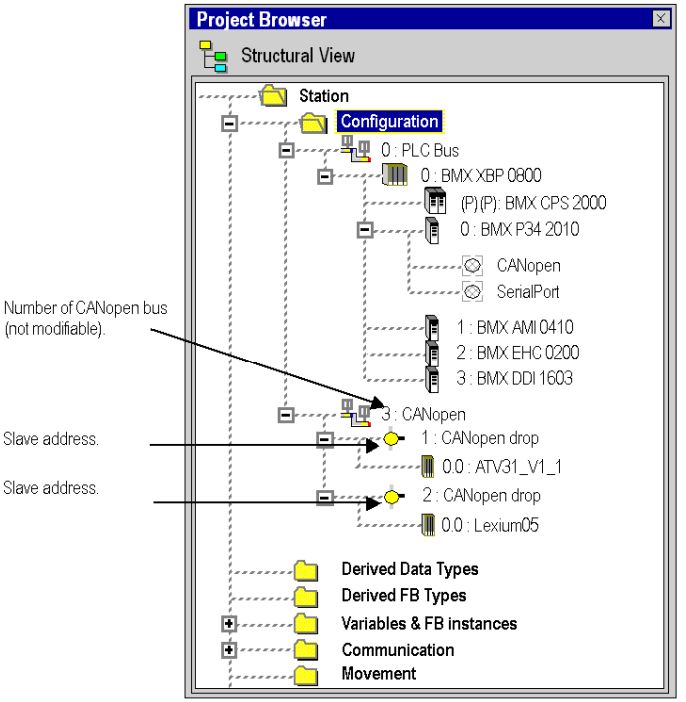
View CANopen Bus in the Project Browser

At a Glance

The CANopen bus is shown is the configuration directory in the project browser. The number of the bus is calculated automatically by Unity Pro.

NOTE: The value of the bus number cannot be modified.

The following illustration shows the CANopen bus and slaves in the project browser:



4.3 Device Configuration

Subject of this Section

This section presents the configuration of the initial parameters of the CANopen devices.

There are three ways of configuring the initial parameters:

- Configuration using Unity,
- Configuration using an external tool,
- Manual Configuration.

NOTE: Before configuring a device, it is strongly recommended to select the function, when available.

What Is in This Section?

This section contains the following topics:

Topic	Page
Slave Functions	62
Configuration Using Unity with CPUs 2010/ 2030	66
Configuration Using Unity with CPUs 20102/ 20302	71
Configuration Using an External Tool: Configuration Software	81
Manual Configuration	84

Slave Functions

At a Glance

So as to facilitate their configuration, certain CANopen devices are represented through functions.

Each function defines premapped PDOs, as well as certain debugging variables which can be mapped (**PDO** tab of the slave configuration screen).

NOTE: The function should be selected before configuring the slave.

Available Functions

The available functions are as follows:

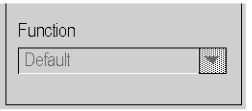
Function	Description	Devices involved
Basic	This function allows a simple control of the speed.	Altivar
MFB	This function allows control of the device through PLCOpen Motion function block library.	
Standard	This function allows control of the speed and/or torque. All the parameters that can be mapped are mapped in the supplemental PDOs for: • an adjustment of the operating parameters (length of acceleration,), • additional surveillance (current value,...), • additional control (PID, outputs command,...).	
Advanced	This function allows control of the speed and/or torque. Certain parameters can be configured and can also be mapped in the PDOs to allow: • an adjustment of the operating parameters (length of acceleration,), • additional surveillance (current value,...), • additional control (PID, outputs command,...).	

Function	Description	Devices involved
Simple	Use this profile if the island does not contain high resolution analog I/O module or the TeSys U STB modules. This profile contains: ● NIM diagnostic information (index 4000-index 4006), ● 8-bit discrete input information (index 6000), ● 16-bit discrete information (index 6100), ● 8-bit discrete output information (index 6200), ● 16-bit discrete output information (index 6300), ● low resolution analog input information (index 6401), ● low resolution analog output information (index 6411). This profile limits the number of index or subindex entries for any of the above objects to 32. If the island configuration exceeds this limitation, please use the Large profile.	STB NCO1010 & NCO2212
Extended	Use this profile if the island contains high resolution analog I/O module or the TeSys U STB modules. This profile contains ● NIM diagnostic information (index 4000-index 4006), ● 8-bit discrete input information (index 6000), ● 16-bit discrete information (index 6100), ● 8-bit discrete output information (index 6200), ● 16-bit discrete output information (index 6300), ● low resolution analog input information (index 6401), ● low resolution analog output information (index 6411), ● high resolution analog input information or HMI words (index 2200-221F), ● high resolution analog output information or HMI words (index 3200-321F), ● TeSys U input information (index 2600-261F), ● TeSys U output information (index 3600-361F). This profile limits the number of index or subindex entries for any of the above objects to 32. If the island configuration exceeds this limitation, please use the Large profile.	

Function	Description	Devices involved
Advanced	Use this profile if the island contains enhanced CANopen devices, special features as run-time parameters along with high resolution analog I/O module or HMI or the TeSys U STB modules. This profile contains: • NIM diagnostic information (index 4000-index 4006), • 8-bit discrete input information (index 6000), • 16-bit discrete information (index 6100), • 8-bit discrete output information (index 6200), • 16-bit discrete output information (index 6300), • low resolution analog input information (index 6401), • low resolution analog output information (index 6411), • high resolution analog input information or HMI words (index 2200-221F), • high resolution analog output information or HMI words (index 3200-321F), • TeSys U input information (index 2600-261F), • TeSys U output information (index 3600-361F), • 3rd party CANopen devices (index 2000-201F), • RTP information (index 4100 & index 4101). This profile limits the number of index or subindex entries for any of the above objects to 32. If the island configuration exceeds this limitation, please use the Large profile.	STB NCO2212
Large Profile	Use this profile if the island configuration does not fit any of the above profiles. This profile contains all the objects available for the STB island and hence will consume more memory address location in the CANopen master.	STB NCO1010 & NCO2212
Controlling	This function is especially created for CANopen communications with the built-in controller card and all the application cards (pump control,...).	Altivar 61/71
Basic	The basic level is designed to configure the valve terminal without CP extension.	Festo CPV
CP_Extension	This level is designed to configure I/Os including the CP extension.	
Basic_DIO_only	The basic level is designed to configure the CPX with pneumatic valves and Digital I/O only.	Festo CPX
Generic_DIO_AIO	The generic DS401 level is designed to configure CPX valves and I/Os, including Analogue I/O modules.	
Advanced	The advanced level is designed to configure the maximum I/Os and the complete parameters set.	

Function	Description	Devices involved
Default	This feature is the default function for certain devices. It may not be modified.	All the slaves except ATV and Lexium

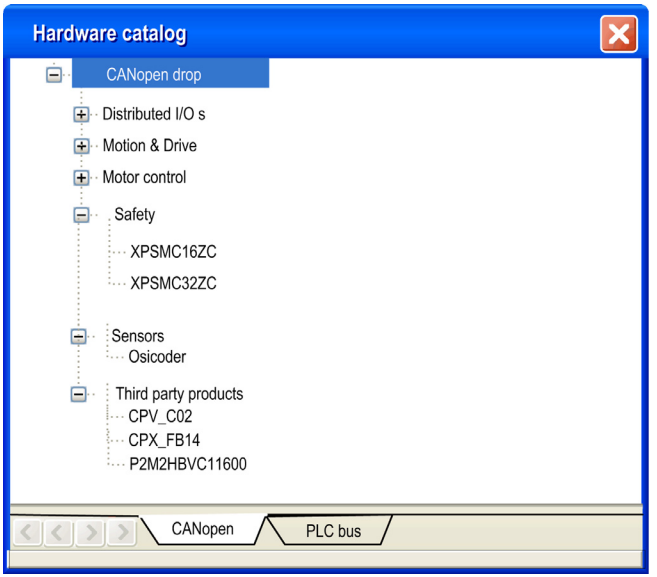
NOTE: Some devices can only handle one function. In this case, the function appears grayed out and cannot be modified.



Configuration Using Unity with CPUs 2010/ 2030

At a Glance

The devices which can be configured using Unity are shown in the Hardware Catalog:



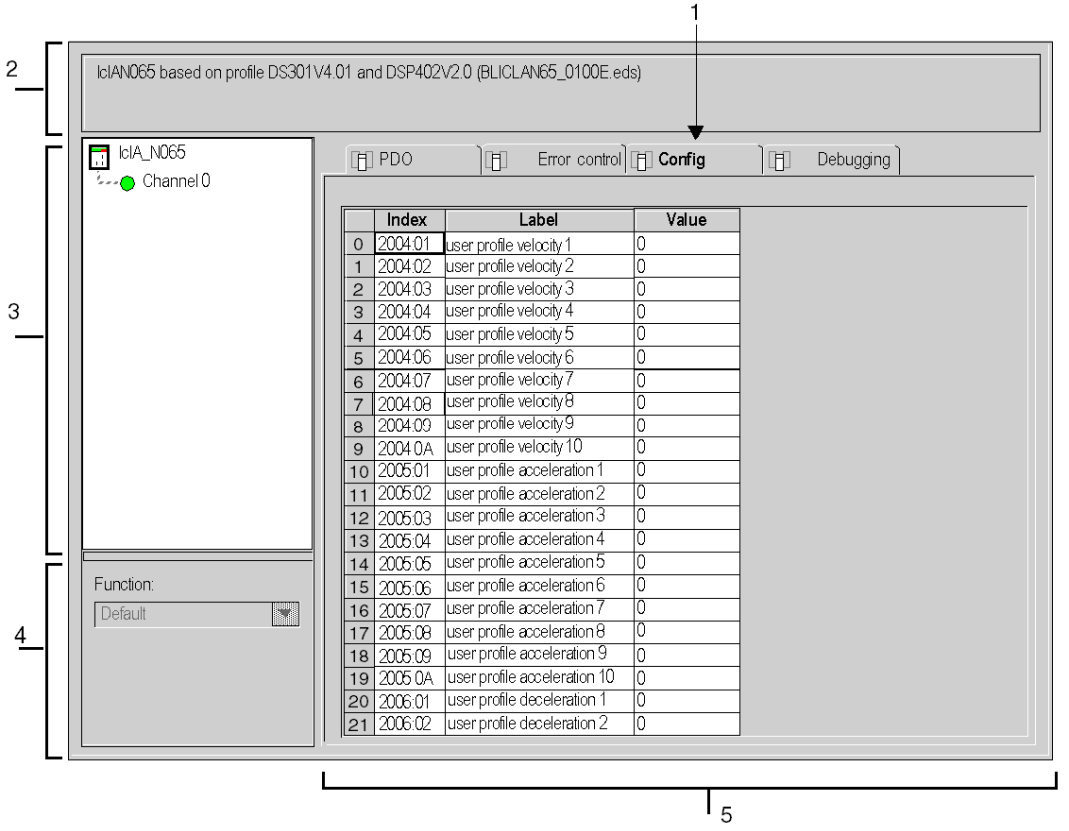
Procedure

To configure a slave, perform the following actions:

Step	Action
1	Access the CANopen *(see page 52)* bus configuration screen.
2	Double-click on the slave to be configured.
3	Configure the usage function using the **Config** tab.
4	Configure the PDOs using the **PDO** tab.
5	Select the error control using the **Error control** tab.

Config tab

The following figure shows an example of the configuration screen of a slave:



	Index	Label	Value
0	2004:01	user profile velocity 1	0
1	2004:02	user profile velocity 2	0
2	2004:03	user profile velocity 3	0
3	2004:04	user profile velocity 4	0
4	2004:05	user profile velocity 5	0
5	2004:06	user profile velocity 6	0
6	2004:07	user profile velocity 7	0
7	2004:08	user profile velocity 8	0
8	2004:09	user profile velocity 9	0
9	2004:0A	user profile velocity 10	0
10	2005:01	user profile acceleration 1	0
11	2005:02	user profile acceleration 2	0
12	2005:03	user profile acceleration 3	0
13	2005:04	user profile acceleration 4	0
14	2005:05	user profile acceleration 5	0
15	2005:06	user profile acceleration 6	0
16	2005:07	user profile acceleration 7	0
17	2005:08	user profile acceleration 8	0
18	2005:09	user profile acceleration 9	0
19	2005:0A	user profile acceleration 10	0
20	2006:01	user profile deceleration 1	0
21	2006:02	user profile deceleration 2	0

The next table shows the various elements of the configuration screen and their functions:

Number	Element	Function
1	Tabs	The tab in the foreground indicates the type of screen displayed. In this case, it is the configuration screen.
2	**Module** area	Gives a reminder of the device's shortened name.
3	**Channel** area	This zone allows you to select the communication channel to be configured. By clicking on the device, you display the following tabs: ● **Description** : gives the characteristics of the device, ● **CANopen**: allows you to access SDO *(see page 159)* (in online mode), ● **I/O Objects**: allows pre-symbolizing of the input/output objects, ● **Fault**: accessible in online mode only. By clicking on the channel, you display the following tabs: ● **PDO**(input/output objects) ● **Error control**, ● **Configuration**. ● **Debug** which can be accessed only in online mode. ● **Diagnostics**, accessible only in Online mode.
4	**General parameters** area	This field allows you to select the slave function.
5	**Configuration** area	This area is used to set up the channels of the devices. Some devices can be configured with an external tool. In this case, the configuration is stored in the device and you cannot enter configuration parameters because this field is empty.

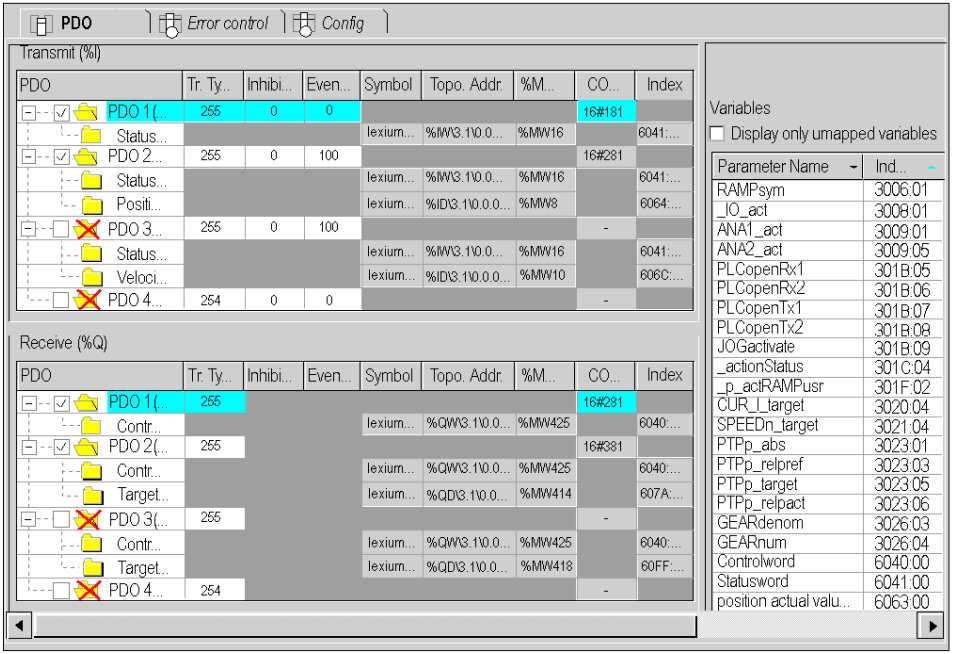
NOTE: Refer to the documentation of each device for information on general, configuration, adjustment and debugging parameters.

NOTE: All parameters are not sent when the device takes its configuration. The CPU send only parameters which are different from the default values.

PDO Tab

PDOs make it possible to manage the communication flow between the CANopen Master and the slaves. The **PDO** tab allows to configure a PDO.

This screen is divided into 3 parts:



- **Transmit PDOs:** information transmitted by the Slave to the Master,
- **Receive PDOs:** information received by the Slave from the Master,
- **Variables:** variables that can be mapped to the PDOs. To assign a variable to a PDO, drag and drop the variable into the desired PDO. No variable can be assigned with a static PDO.

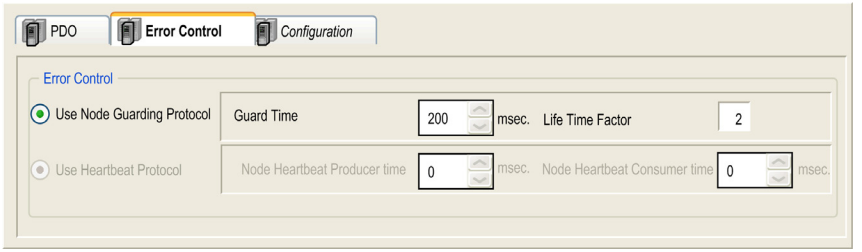
NOTE: To configure the STB NCO 1010, it's necessary to determine all the objects that are valid for this device and to configure them manually in the PDOs.

For more information about the list of the associated objects, please refer to the STB user manual.

For more information about the use of the PDOs, see [...].

Error Control Tab

The **Error control** tab for CANopen slave modules allows you to configure monitoring.



Two choices are possible:

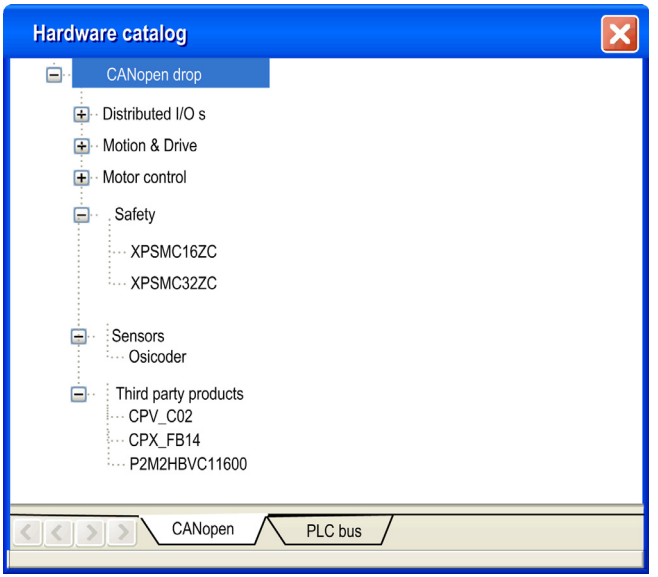
- **Heartbeat:** The Heartbeat mechanism consists of sending cyclical presence messages generated by a Heartbeat Producer. A Heartbeat transmitter (producer) sends messages recurringly. The sending time is configured with the `Node Heartbeat Procucer Time Value`. One or several elements connected to the network receive this message. The Heartbeat consumer surveys the Heartbeat message reception. The default value of consumer time is set to (1.5 * `Producer Heartbeat Time`). If its duration exceeds the `Heartbeat Consumer Time` (1.5 * `Producer Heartbeat Time`), an `Hearbeat event` is created and the device is in default.
  If a M340 Master PLC is used on the CANopen bus, all the nodes using the Heartbeat control mode are producers. The master surveys the transmission and the reception of the messages and it is the only receiver of the Heartbeat messages sent by the nodes
  Unity supports devices that are only heartbeat producer (no consumer) and does not support the node guarding. In this case, the value of node heartbeat consumer time is set to 0. This value is displayed on the error control tab of the device.
  The Master can send Heartbeat messages to the slaves. The Master Heartbeat producer time is set at 200 ms and is not modifiable.
- **Node guarding:** Node Guarding is the monitoring of network nodes. The NMT (Network Management) master sends an RTR (Remote Transmission Request) at regular intervals (this period is called Guard Time) and the concerned node must answer in a given time lapse (the Node Life Time equals the Guard Time multiplied by the Life Time Factor).
  The Life Time value is set at 2 and is not modifiable.

NOTE: Some devices only support Heartbeat or Node Guarding. For devices which support Heartbeat and Node Guarding, the only choice in Unity Pro is the Heartbeat mechanism.

Configuration Using Unity with CPUs 20102/ 20302

At a Glance

The devices which can be configured using Unity are shown in the Hardware Catalog:



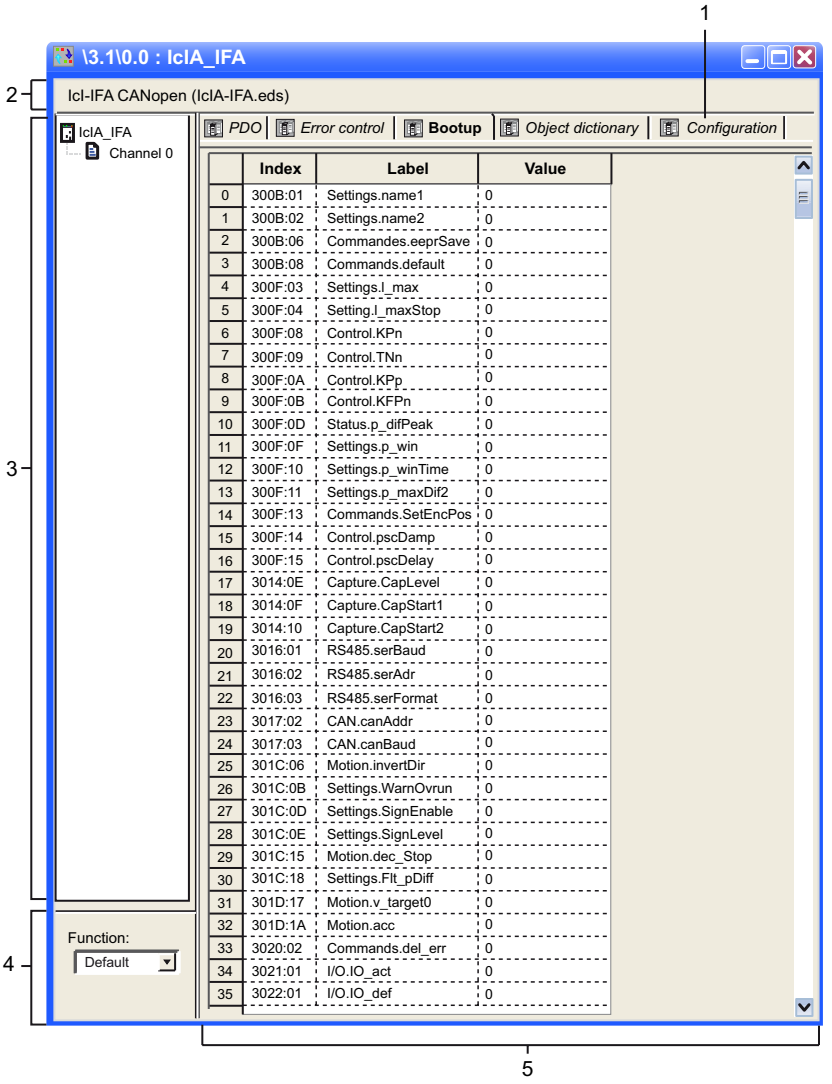
Procedure

To configure a slave, perform the following actions:

Step	Action
1	Access the CANopen *(see page 52)* bus configuration screen.
2	Double-click on the slave to be configured.
3	Configure the Bootup Procedure using the **Bootup** tab.
4	Integrate a third pary product using the **Object Dictionary** tab.
5	Configure the usage function using the **Config** tab.
6	Configure the PDOs using the **PDO** tab.
7	Select the error control using the **Error control** tab.

Configuration Tab

The following figure shows an example of the configuration screen of a slave:



	Index	Label	Value
0	300B:01	Settings.name1	0
1	300B:02	Settings.name2	0
2	300B:06	Commandes.eeprSave	0
3	300B:08	Commands.default	0
4	300F:03	Settings.I_max	0
5	300F:04	Setting.I_maxStop	0
6	300F:08	Control.KPn	0
7	300F:09	Control.TNn	0
8	300F:0A	Control.KPp	0
9	300F:0B	Control.KFPn	0
10	300F:0D	Status.p_difPeak	0
11	300F:0F	Settings.p_win	0
12	300F:10	Settings.p_winTime	0
13	300F:11	Settings.p_maxDif2	0
14	300F:13	Commands.SetEncPos	0
15	300F:14	Control.pscDamp	0
16	300F:15	Control.pscDelay	0
17	3014:0E	Capture.CapLevel	0
18	3014:0F	Capture.CapStart1	0
19	3014:10	Capture.CapStart2	0
20	3016:01	RS485.serBaud	0
21	3016:02	RS485.serAdr	0
22	3016:03	RS485.serFormat	0
23	3017:02	CAN.canAddr	0
24	3017:03	CAN.canBaud	0
25	301C:06	Motion.invertDir	0
26	301C:0B	Settings.WarnOvrun	0
27	301C:0D	Settings.SignEnable	0
28	301C:0E	Settings.SignLevel	0
29	301C:15	Motion.dec_Stop	0
30	301C:18	Settings.Flt_pDiff	0
31	301D:17	Motion.v_target0	0
32	301D:1A	Motion.acc	0
33	3020:02	Commands.del_err	0
34	3021:01	I/O.IO_act	0
35	3022:01	I/O.IO_def	0

The next table shows the various elements of the configuration screen and their functions:

Number	Element	Function
1	Tabs	The tab in the foreground indicates the type of screen displayed. In this case, it is the configuration screen.
2	**Module** area	Gives a reminder of the device's shortened name.
3	**Channel** area	This zone allows you to select the communication channel to be configured. By clicking on the device, you display the following tabs: • **Description** : gives the characteristics of the device, • **CANopen**: allows you to access SDO (in online mode), • **I/O Objects**: allows pre-symbolizing of the input/output objects, • **Fault**: accessible in online mode only. By clicking on the channel, you display the following tabs: • **PDO** (input/output objects), • **Error control**, • **Bootup**, • **Object DIctionary**, • **Configuration**, • **Debug** which can be accessed only in online mode, • **Diagnostics**, accessible only in Online mode.
4	**General parameters** area	This field allows you to select the slave function.
5	**Configuration** area	This area is used to set up the channels of the devices. Some devices can be configured with an external tool. In this case, the configuration is stored in the device and you cannot enter configuration parameters because this field is empty.

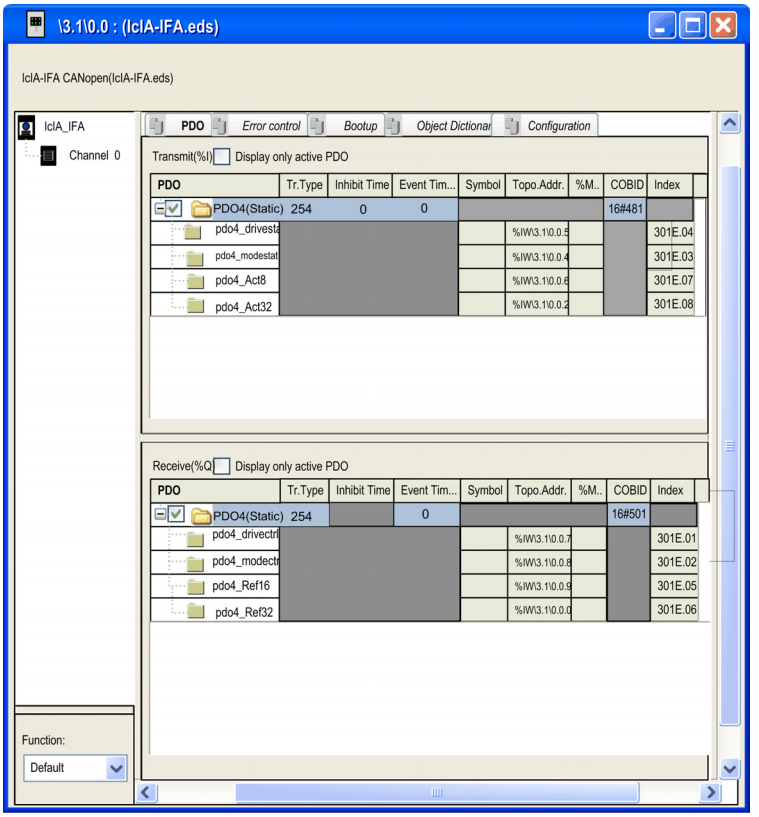
NOTE: Refer to the documentation of each device for information on general, configuration, adjustment and debugging parameters.

NOTE: All parameters are not sent when the device takes its configuration. The CPU send only parameters which are different from the default values.

PDO Tab

PDOs make it possible to manage the communication flow between the CANopen Master and the slaves. The **PDO** tab allows to configure a PDO.

This screen is divided into 3 parts:



- **Transmit PDOs:** information transmitted by the Slave to the Master,
- **Receive PDOs:** information received by the Slave from the Master,
- **Variables:** variables that can be mapped to the PDOs. To assign a variable to a PDO, drag and drop the variable into the desired PDO. No variable can be assigned with a static PDO.

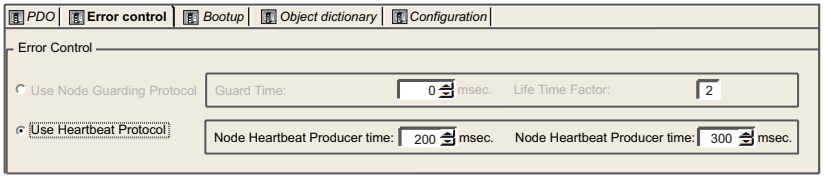
NOTE: To configure the STB NCO 1010, it's necessary to determine all the objects that are valid for this device and to configure them manually in the PDOs.

For more information about the list of the associated objects, please refer to the STB user manual.

For more information about the use of the PDOs, see [...].

Error Control Tab

The **Error control** tab for CANopen slave modules allows you to configure monitoring.



Two choices are possible:

- **Heartbeat:** The Heartbeat mechanism consists of sending cyclical presence messages generated by a Heartbeat Producer. A Heartbeat transmitter (producer) sends messages recurringly. The sending time is configured with the `Node Heartbeat Procucer Time Value`. One or several elements connected to the network receive this message. The Heartbeat consumer surveys the Heartbeat message reception. The default value of consumer time is set to (1.5 * `Producer Heartbeat Time`). If its duration exceeds the `Heartbeat Consumer Time` (1.5 * `Producer Heartbeat Time`), an `Hearbeat event` is created and the device is in default.
  If a M340 Master PLC is used on the CANopen bus, all the nodes using the Heartbeat control mode are producers. The master surveys the transmission and the reception of the messages and it is the only receiver of the Heartbeat messages sent by the nodes
  Unity supports devices that are only heartbeat producer (no consumer) and does not support the node guarding. In this case, the value of node heartbeat consumer time is set to 0. This value is displayed on the error control tab of the device.
  The Master can send Heartbeat messages to the slaves. The Master Heartbeat producer time is set at 200 ms and is not modifiable.
- **Node guarding:** Node Guarding is the monitoring of network nodes. The NMT (Network Management) master sends an RTR (Remote Transmission Request) at regular intervals (this period is called Guard Time) and the concerned node must answer in a given time lapse (the Node Life Time equals the Guard Time multiplied by the Life Time Factor).
  The Life Time value is set at 2 and is not modifiable.

NOTE: Some devices only support Heartbeat or Node Guarding. For devices which support Heartbeat and Node Guarding, the only choice in Unity Pro is the Heartbeat mechanism.

Bootup Tab

⚠ WARNING

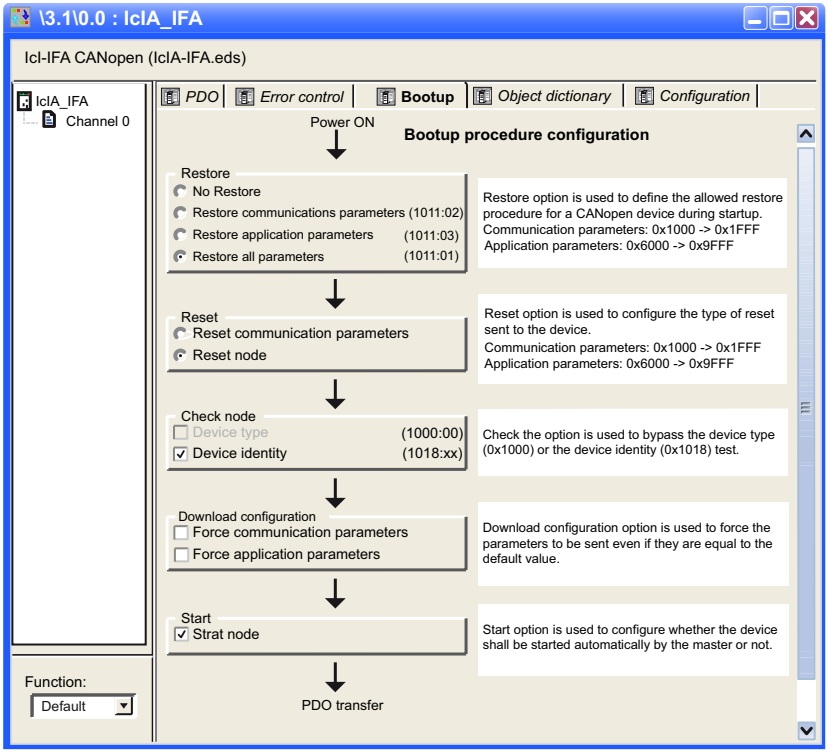
UNEXPECTED EQUIPMENT OPERATION

Manually verify all deactivated standard checks on the device before operating the system.

Changing the default parameters of the Bootup tab will bypass standard system checks.

Failure to follow these instructions can result in death, serious injury, or equipment damage.

The **Bootup tab** allows you to configure the Bootup procedure:


\3.1\0.0 : IclA_IFA
IcI-IFA CANopen (IclA-IFA.eds)
IclA_IFA
Channel 0
PDO
Error control
Bootup
Object dictionary
Configuration
Power ON
Bootup procedure configuration
Restore
No Restore
Restore communications parameters (1011:02)
Restore application parameters (1011:03)
Restore all parameters (1011:01)
Restore option is used to define the allowed restore procedure for a CANopen device during startup.
Communication parameters: 0x1000 -> 0x1FFF
Application parameters: 0x6000 -> 0x9FFF
Reset
Reset communication parameters
Reset node
Reset option is used to configure the type of reset sent to the device.
Communication parameters: 0x1000 -> 0x1FFF
Application parameters: 0x6000 -> 0x9FFF
Check node
Device type (1000:00)
Device identity (1018:xx)
Check the option is used to bypass the device type (0x1000) or the device identity (0x1018) test.
Download configuration
Force communication parameters
Force application parameters
Download configuration option is used to force the parameters to be sent even if they are equal to the default value.
Start
Strat node
Start option is used to configure whether the device shall be started automatically by the master or not.
Function:
Default
PDO transfer

The goal of bootup procedure tab is to bypass the standard bootup procedure for devices which do not comply with CANopen standards.

The following paragraph defines the different functionalities of the Bootup procedure:

- The type of restore:
  - No Restore: option enabled by default.
  - Restore communication parameters: enabled option according to the object 0x1011sub02. If the option is checked, all parameters between 0x1000 to 0x1FFF are restored.
  - Restore application parameters: enabled option according to the object 0x1011sub03. If the option is checked and if the device correctly implements the service, all application parameters are restored.
  - Restore all: enabled option according to the object 0x1011sub01. If the option is checked, all parameters are restored (default value).
- The type of reset:
  - Reset communication parameters: option always enabled. If the option is checked, all communication parameters are reset.
  - Reset node (default value): option always enabled. If the option is checked, all parameters are reset.
- The check device type and identity (checked by default):
  - If the device type identification value for the slave in object dictionary 0x1F84 is not 0x0000 ("don't care"), compares it to the actual value.
  - If the configured Vendor ID in object dictionary 0x1F85 is not 0x0000 ("don't care"), read slave index 0x1018, Sub-Index 1 and compare it to the actual value.
  - The same comparison is done with ProductCode, RevisionNumber and SerialNumber with the according objects 0x1F86-0x1F88.

NOTE: Unchecked option DeviceType forces the object dictionary 0x1F84 to 0x0000.

NOTE: Unchecked option identity forces the object dictionary 0x1F86-0x1F88 (sub device nodeID) to 0x0000.

- Forces the download of communication or configuration parameters (unchecked by default). If option is checked, it forces all the corresponding objects to be downloaded.
  If the option is unchecked, you must follow these standard rules:
  - Parameters are downloaded if they are different from the default value.
  - Parameters are downloaded if they are forced in the object dictionary.
  - Parameters are not downloaded in the other cases.
- The start Node:
  If option is checked (default value), the CANopen master starts automatically the device after the bootup procedure.
  If option is unchecked, the device stays in pre-operational state after bootup procedure. In this case, the device must be started by the application program.

Object Dictionary Tab

⚠ WARNING

UNEXPECTED EQUIPMENT OPERATION

Manually verify all Object Dictionary values.

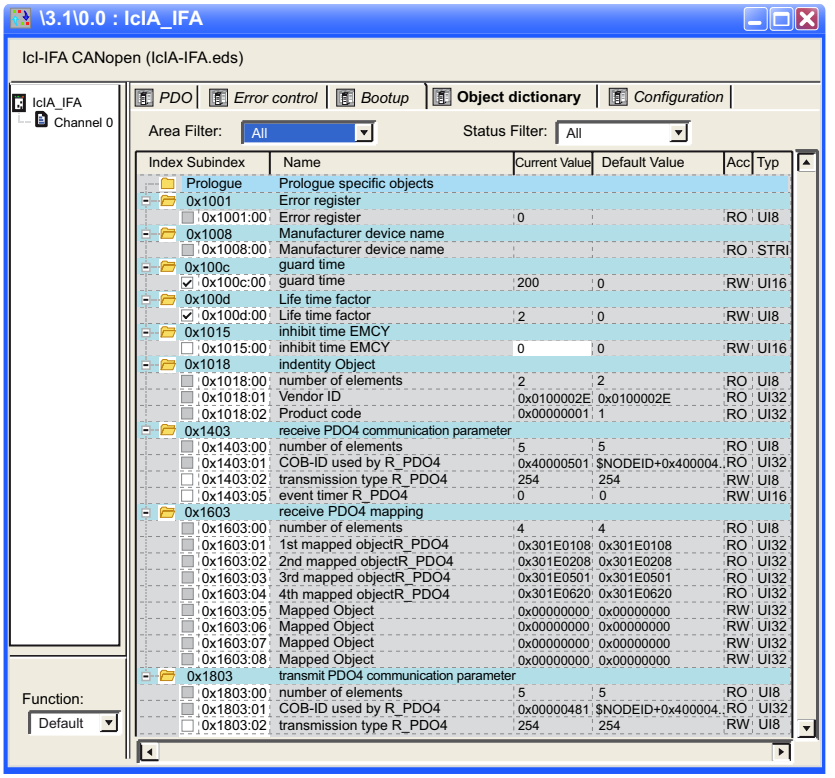
Changing the default values of the Object Dictionary table will generate non-standard behaviour of the equipment.

Failure to follow these instructions can result in death, serious injury, or equipment damage.

The **Object Dictionary tab** allows you to configure and integrate third party products, by:

- Force parameters to be transmitted even if they are unchanged, by ticking the associated checkbox of each parameter.
- Block parameters that do not need to be sent to the device, by removing tick of the associated checkbox of each parameter.
- Set objects to a specific value just before (prologue), or just after (epilogue) the standard boot up procedure.
- Modify the current value of an object (except read only objects), if the value box is not greyed out, by typing value you wish in the box. By default, if the current value is modified, the object is sent. Nevertheless, after filling the box, you still have the choice to modify this behaviour, by removing the mark of the checkbox in order to block the object sending. To prevent programming redundancies or conflicts, parameters which can be modified in other tabs, Configuration, PDO or Error Control, are greyed out in the Object Dictionary tab.

The following illustration describes th **Object Dictionary tab**:


\3.1\0.0 : IclA_IFA
IcI-IFA CANopen (IclA-IFA.eds)
IclA_IFA
Channel 0
PDO
Error control
Bootup
Object dictionary
Configuration
Area Filter: All
Status Filter: All
Index Subindex | Name | Current Value | Default Value | Acc | Typ
Prologue | Prologue specific objects
0x1001 | Error register
0x1001:00 | Error register | 0 | RO | UI8
0x1008 | Manufacturer device name
0x1008:00 | Manufacturer device name | RO | STRI
0x100c | guard time
0x100c:00 | guard time | 200 | 0 | RW | UI16
0x100d | Life time factor
0x100d:00 | Life time factor | 2 | 0 | RW | UI8
0x1015 | inhibit time EMCY
0x1015:00 | inhibit time EMCY | 0 | 0 | RW | UI16
0x1018 | indentity Object
0x1018:00 | number of elements | 2 | 2 | RO | UI8
0x1018:01 | Vendor ID | 0x0100002E | 0x0100002E | RO | UI32
0x1018:02 | Product code | 0x00000001 | 1 | RO | UI32
0x1403 | receive PDO4 communication parameter
0x1403:00 | number of elements | 5 | 5 | RO | UI8
0x1403:01 | COB-ID used by R_PDO4 | 0x40000501 | $NODEID+0x400004.. | RO | UI32
0x1403:02 | transmission type R_PDO4 | 254 | 254 | RW | UI8
0x1403:05 | event timer R_PDO4 | 0 | 0 | RW | UI16
0x1603 | receive PDO4 mapping
0x1603:00 | number of elements | 4 | 4 | RO | UI8
0x1603:01 | 1st mapped objectR_PDO4 | 0x301E0108 | 0x301E0108 | RO | UI32
0x1603:02 | 2nd mapped objectR_PDO4 | 0x301E0208 | 0x301E0208 | RO | UI32
0x1603:03 | 3rd mapped objectR_PDO4 | 0x301E0501 | 0x301E0501 | RO | UI32
0x1603:04 | 4th mapped objectR_PDO4 | 0x301E0620 | 0x301E0620 | RO | UI32
0x1603:05 | Mapped Object | 0x00000000 | 0x00000000 | RW | UI32
0x1603:06 | Mapped Object | 0x00000000 | 0x00000000 | RW | UI32
0x1603:07 | Mapped Object | 0x00000000 | 0x00000000 | RW | UI32
0x1603:08 | Mapped Object | 0x00000000 | 0x00000000 | RW | UI32
0x1803 | transmit PDO4 communication parameter
0x1803:00 | number of elements | 5 | 5 | RO | UI8
0x1803:01 | COB-ID used by R_PDO4 | 0x00000481 | $NODEID+0x400004.. | RO | UI32
0x1803:02 | transmission type R_PDO4 | 254 | 254 | RW | UI8
Function:
Default

You can drag&drop available object, except many of them, from the index folder to the prolog or epilog section. In the event of the insertion of some forbidden ones, like PDOs or read-only for instance, a pop-up appears.

NOTE: An object which have been put in the prolog or epilog section will always be sent.

You can select 2 filters to reduce the number of displayed objects on the grid: :

Area Filter	
All	show all area.
Prologue/ Epilogue	show only prologue and epilogue projects
[XXXX...YYYY]	show only objects between XXXX to YYYY
Status filter	
All	show all objects
Configured	show only transmitted objects to the device during boot up
Not Configured	show only not transmitted objects to the device
Modified	show only objects from which values are different from default values

You can right click on an object to execute function:

Right click on an object in the prologue and epilogue sections	
Cut	Cut the row and copy the object in the clipboard
Copy	Copy the object in the clipboard
Paste	Paste the object in the selected row
Delete	Delete the selected object
Move up	Used to manage the order fo the list
Move down	Used to manage the order fo the list
Configured	If checked, the object is transmitted to the device
Expand all	Expand all nodes of the tree
Collapse all	Collapse all nodes of the tree
Right click on an object in the standard sections	
Copy	Copy the object on the clipboard
Configured	If checked, the object is transmitted to the device
Expand all	Expand all nodes of the tree
Collapse all	Collapse all nodes of the tree

NOTE: some functions are only available in prolog-epilog section.

Configuration Using an External Tool: Configuration Software

At a Glance

To configure a Lexium 05/15, an IcLA, a Tesys U or an ATV61/71 device, it is necessary to use an external tool:

- Advantys Configuration Software for the STB,
- PowerSuite V2.5 Software for Lexium 05,
- Powersuite V2.5 Software for the ATV31, ATV61, ATV71 and the Tesys U,
- UNILINK V1.5 for the Lexium 15 LP,
- UNILINK V4.0 for the Lexium 15 MH,
- EasyIclA V1.104 for ICLA_IFA, ICLA_IFE, ICLA_IFS.

NOTE: To facilitate the configuration and programming of the motion and drives devices, it is highly recommended to use the software in conjonction with the Unity MFBs.

NOTE: You can do autoconfiguration with NCO2212, as with a NCO1010.

Advantys Configuration Software

Advantys Configuration Software (Version 2.5 or higher) has to be used to configure a STB NCO 2212. The Advantys Configuration Software validates the configuration and creates a DCF file that contains all the objects used in the configuration ordered in the proper sequence. The DCF file can be imported from Unity Pro.

NOTE: The creation of the DCF file is only possible from the full version of Advantys.

⚠ WARNING

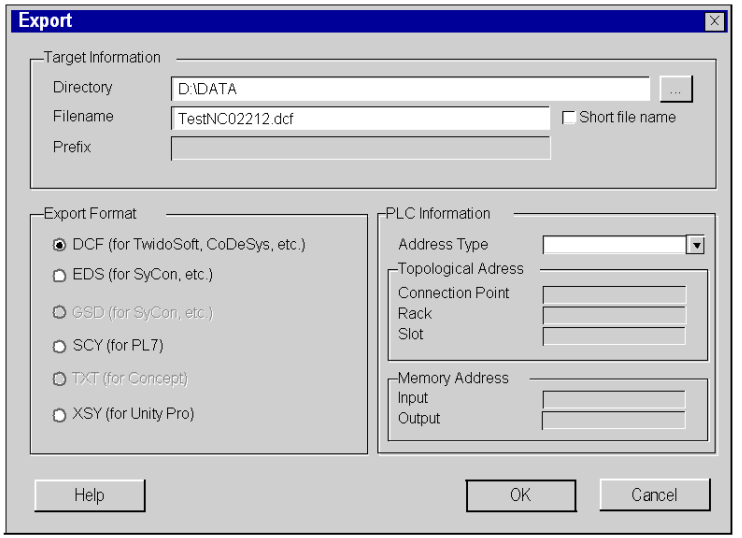
RISK OF UNINTENDED OPERATION

The symbol file ***.xsy** generated by Advantys must not be used in Unity Pro during the configuration of an STB Island.

The assignment of inputs and outputs to %MW objects is different.

Failure to follow these instructions can result in death, serious injury, or equipment damage.

The procedure for adding an island to a CANopen bus is as follows:

Step	Action
1	In Advantys Configuration Software (Version 2.2 or above), create a new Island.
2	Select the STB NCO 2212 Network Interface Module.
3	Select the modules which will be used in the application.
4	Configure the island.
5	When the configuration is over, click on **File/Export** to export the island in DCF format. The following window is displayed: 
6	Click **OK** to confirm.
7	Once the file is exported, launch Unity Pro and open the project in which the island will be used.
8	Add a STB device to the Bus Editor (see *How to Add a Device on the Bus, page 56*).
9	Right-click on the STB device, then click on **Open the module**.
10	In the PDO tab, click the button **Import DCF**.
11	Confirm by clicking **OK**. The PDOs are configured automatically.

NOTE: The modification of the topology of an island requires recommencing this procedure.

For more information about the STB configuration, please refer to the STB user manual.

Powersuite Software

The PowerSuite software development is a tool meant to implement the following Altivar speed drives. It should be used to configure an ATV31/61/71, a Tesys U or a Lexium 05 device (Powersuite 2)

Various functions are integrated for being used on implementing phases such as:

- configurations preparations,
- setting to work,
- maintenance.

The configuration is directly stored in the device.

For more information about the configuration of an ATV31/61/71 and Tesys U using Powersuite Software or about the configuration of a Lexium 05 with Power Suite 2, please refer to the device user manual.

UNILINK Software

UNILINK provides simplified parameter setting for Lexium 05/ Lexium15 servo drives. It is used to configure, sets and adjusts Lexium 15LP/MP/HP drives according to the associated SER/BPH brushless motor and the application requirements.

For more information about the configuration of a Lexium 15 using UNILINK, please refer to the Lexium user manual.

Manual Configuration

At a Glance

ATV 31 and Icla devices can be configured manually from their front panel.

Configuration of the ATV 31

The following figure presents the different front panels of the ATV 31 servodrive.

ATV31xxxxx

ATV31xxxxxxA

The ATV 31 may be configured as follows:

Step	Action
1	Press on the "ENT" key to enter the ATV31 configuration menu.
2	Use the "Arrows" keys to select the "COM" Communication menu then confirm using the "ENT" key.
3	Use the "Arrows" keys to select the "AdCO" menu then confirm using the "ENT" key. Enter a value (Address on the CANopen bus). Confirm using the "ENT" key then exit the menu using the "ESC" key
4	Use the "Arrows" keys to select the "bdCO" menu then confirm using the "ENT" key. Enter a value (Speed on the CANopen bus). Confirm using the "ENT" key then exit the menu using the "ESC" key
5	Press several times on the "ESC" key to exit the configuration menu.

NOTE: The configuration may be modified only when the motor is stopped and when the variable speed controller is locked (cover closed). Any modification entered will become effective after an "Off/On" cycle of the speed controller.

For more information about the ATV31 configuration, please refer to the Altivar speed drive user manual.

4.4 Master Configuration

Subject of this Section

This section presents the master configuration.

What Is in This Section?

This section contains the following topics:

Topic	Page
How to Access the CANopen Master Configuration Screen	86
CANopen Master Configuration Screen with CPUs 2010/ 2030	88
Description of Master Configuration Screen for CPUs 2010/ 2030	90
CANopen Master Configuration Screen with CPUs 20102/ 20302	93
Description of Master Configuration Screen for CPUs 20102/ 20302	95

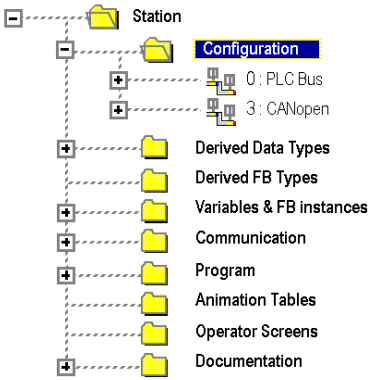
How to Access the CANopen Master Configuration Screen

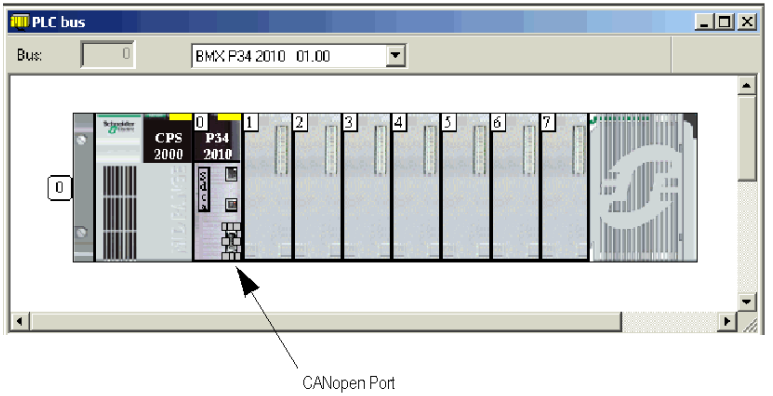
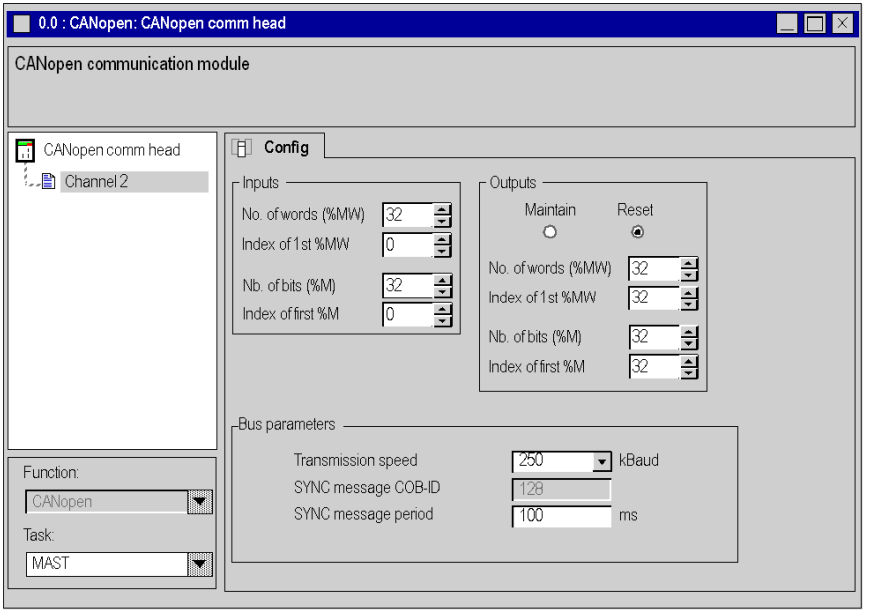
At a Glance

This describes how to access the configuration screen of the master for a Modicon M340 PLC with a built-in CANopen link.

Procedure

To access the master, carry out the following actions:

Step	Action
1	From the project navigator, deploy the `Configuration` directory. **Result**: the following screen appears: 

Step	Action
2	Double-click on the `PLC Bus` subdirectory. **Result**: the following screen appears:  Double-click on the processor's CANopen port.
3	The master configuration screen appears: 

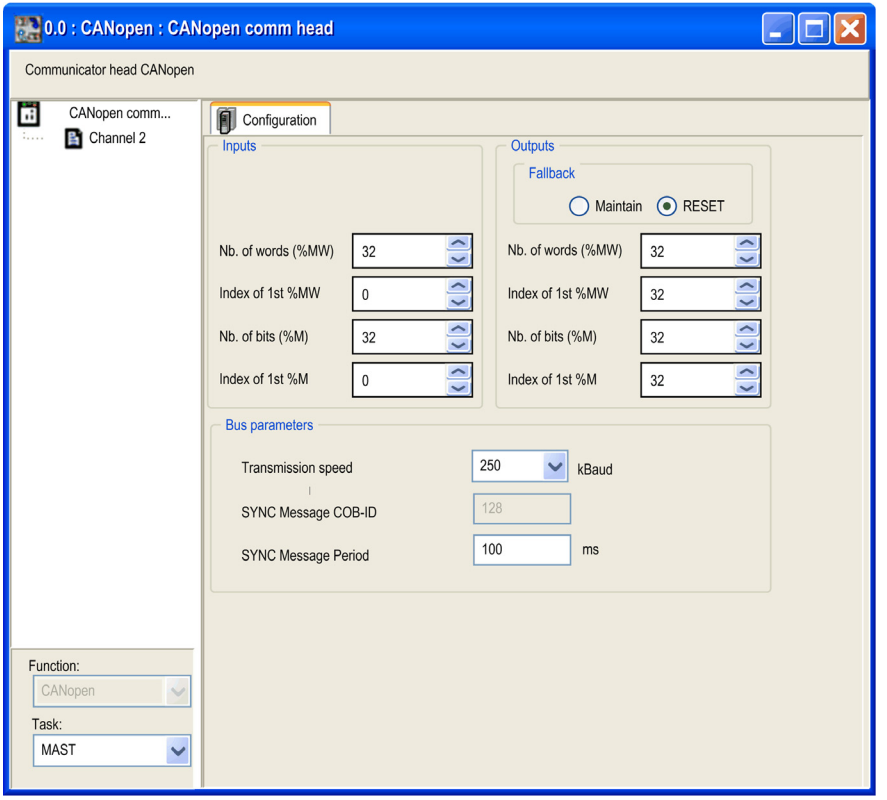
CANopen Master Configuration Screen with CPUs 2010/ 2030

At a Glance

This screen is used to declare and configure the master of the CANopen network from a Modicon M340 PLC station.

Illustration

The configuration screen of the master is as follows:



Elements and functions

The table below describes the different areas which make up the master configuration screen:

Read	Number	Function
1	Tab	The tab in the foreground indicates the type of screen displayed. In this case, it is the configuration screen.
2	Module	This area is made up of the abbreviated heading of the processor equipped with a CANopen port.
3	Channel	This zone allows you to select the communication channel to be configured. By clicking on the device, you display the tabs: ● **Description** : gives the characteristics of the built-in CANopen port, ● **Inputs/outputs objects**: allows pre-symbolizing of the input/output objects, By clicking on a channel, you display the tabs: ● **Config** . enables you to declare and configure the CANopen master, ● **Debug** : accessible in online mode only, ● **Fault**: accessible in online mode only.

4	General parameters	This field enables you to:
		● associate the CANopen bus to an application task:
		  ● MAST which is the master task,
		  ● FAST which is the rapid task.
		The tasks are asynchronous in relation to exchanges on the bus.

5	Configuration	This field enables you to: ● configure the PLC internal memory addresses where inputs from the CANopen devices will periodically be copied. ● configure the PLC internal memory addresses where outputs from the CANopen devices will periodically be read. ● configure the parameters of the CANopen bus.

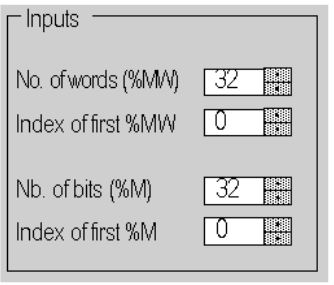
Description of Master Configuration Screen for CPUs 2010/ 2030

At a Glance

The configuration screen allows configuration of the bus parameters as well as the inputs and outputs.

Inputs

The figure below illustrates the inputs configuration area:

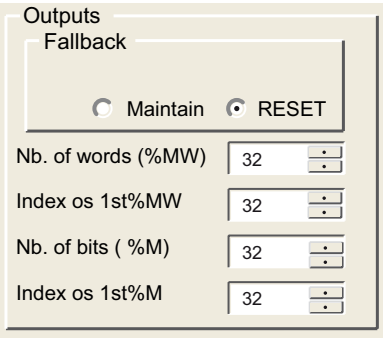


To configure the inputs of the bus slaves, it is necessary to indicate the memory areas to which they will be periodically recopied. To define this zone, you must indicate:

- a number of words (%MW): from 0 to 32,464,
- the address of the first word: from 0 to 32,463,
- the number of bits (%M): from 0 to 32,634,
- the address of the first bit: from 0 to 32,633.

Outputs

The figure below illustrates the outputs configuration area:



The fallback information area contains two radio buttons as well, which defines the behaviour of the device when the CPU is in STOP or in HALT:

- **Maintain**: maintains outputs (values are kept),
- **Reset:** resets outputs (values are set to 0).

To configure the outputs, it is necessary to indicate, as for the inputs, the word and bits tables that will contain the values of the bus slave outputs:

- a number of words (%MW): from 1 to 32,464,
- the address of the first word: from 0 to 32,463,
- the number of bits (%M): from 1 to 32,634,
- the address of the first bit: from 0 to 32,633.

NOTE: The word tables and bit tables are found in the PLC internal memory. Any crossover between two areas of each table is prohibited. The bits area for the inputs cannot overlap the bits area for the outputs. The words area for the inputs cannot overlap the words area for the outputs.

⚠ WARNING

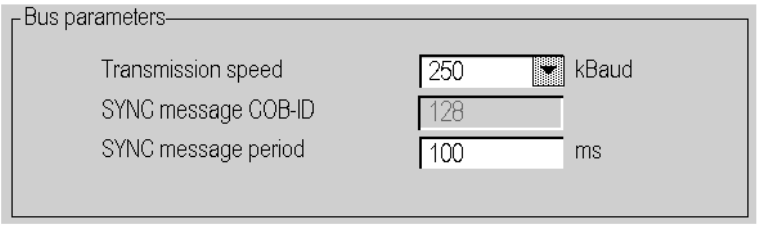
UNEXPECTED EQUIPMENT OPERATION

In case of a CANopen bus interruption verify the fallback positions of all devices on the bus are as expected. Consult the relevant equipment's documentation for additional information.

Failure to follow these instructions can result in death, serious injury, or equipment damage.

Bus Parameters

The figure below illustrates the bus parameters configuration area:



To configure the bus, it is necessary to indicate:

- The transmission speed *(see Premium and Atrium using Unity Pro, CANopen Field Bus, User manual)* : 250kBauds default,
- the COB-ID of the synchronization message: 128 default,
- the synchronization message period: 100 ms default.

Language Objects

The parameters presented below are represented in the %KW language objects:

Read	Parameter	Language object
Inputs	Number of words %MW	%KW8
	Index of the first word	%KW10
	Number of bits %M	%KW4
	Index of the first bit	%KW6
Outputs	Fallback mode	%KW0 Least Significant Byte : 16#00, Bit 2 to 7= 0, and : ● Bit 0= 0 and Bit 1= 0: reset of outputs if task in STOP or HALT ● Bit 0= 1 and Bit 1= 0: maintain of outputs if task in STOP or HALT ● Bit 0= 0 and Bit 1= 1: bus in STOP if task in STOP or HALT
	Number of words %MW	%KW9
	Index of the first word	%KW11
	Number of bits %M	%KW5
	Index of the first bit	%KW7
Bus parameters	Transmission speed	%KW1
	SYNC message COB-ID	%KW2
	SYNC message period	%KW3

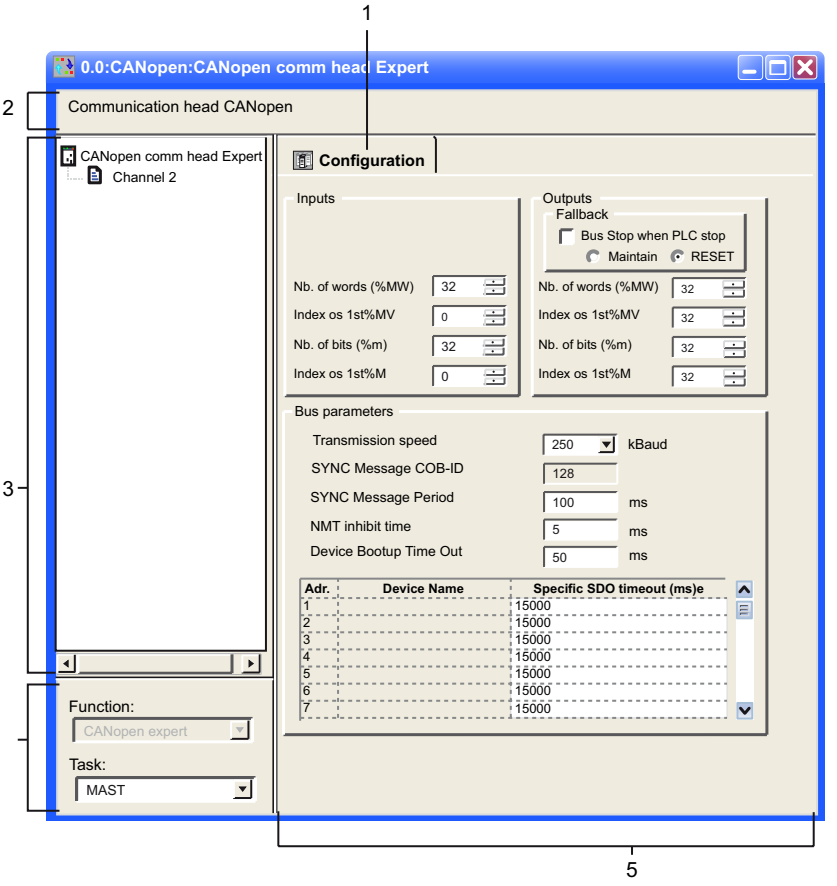
CANopen Master Configuration Screen with CPUs 20102/ 20302

At a Glance

This screen is used to declare and configure the master of the CANopen network from a Modicon M340 PLC station.

Illustration

The configuration screen of the master is as follows:



Elements and functions

The table below describes the different areas which make up the master configuration screen:

Read	Number	Function
1	Tab	The tab in the foreground indicates the type of screen displayed. In this case, it is the configuration screen.
2	Module	This area is made up of the abbreviated heading of the processor equipped with a CANopen port.
3	Channel	This zone allows you to select the communication channel to be configured. By clicking on the device, you display the tabs: ● **Description** : gives the characteristics of the built-in CANopen port, ● **Inputs/outputs objects**: allows pre-symbolizing of the input/output objects, By clicking on a channel, you display the tabs: ● **Config** . enables you to declare and configure the CANopen master, ● **Debug** : accessible in online mode only, ● **Fault**: accessible in online mode only.

4	General parameters	This field enables you to:
		● associate the CANopen bus to an application task:
		  ● MAST which is the master task,
		  ● FAST which is the rapid task.
		The tasks are asynchronous in relation to exchanges on the bus.

5	Configuration	This field enables you to: ● configure the PLC internal memory addresses where inputs from the CANopen devices will periodically be copied. ● configure the PLC internal memory addresses where outputs from the CANopen devices will periodically be read. ● configure the parameters of the CANopen bus.

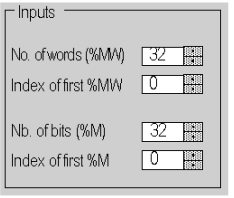
Description of Master Configuration Screen for CPUs 20102/ 20302

At a Glance

The configuration screen allows configuration of the bus parameters as well as the inputs and outputs.

Inputs

The figure below illustrates the inputs configuration area:

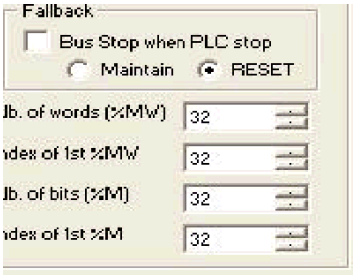


To configure the inputs of the bus slaves, it is necessary to indicate the memory areas to which they will be periodically recopied. To define this zone, you must indicate:

- a number of words (%MW): from 0 to 32,464,
- the address of the first word: from 0 to 32,463,
- the number of bits (%M): from 0 to 32,634,
- the address of the first bit: from 0 to 32,633.

Outputs

The figure below illustrates the outputs configuration area:



NOTE: The checkbox **Bus Stop when PLC stop** in the fallback area configuration is only available in CANopen expert mode.

- **If it is not checked:** the CANopen bus remains in RUN after a PLC stop and the global strategy of fallback is applied to the outputs according to Maintain or Reset radio button.
- **If it is checked:** the CANopen bus is stopped when a PLC stop; in this case, **Maintain** and **Reset** radio buttons are greyed out.

The fallback information area contains two radio buttons as well, which defines the behaviour of the device when the CPU is in STOP or in HALT:

- **Maintain**: maintains outputs (values are kept)
- **Reset:** resets outputs (values are set to 0)

To configure the outputs, it is necessary to indicate, as for the inputs, the word and bits tables that will contain the values of the bus slave outputs:

- A number of words (%MW): from 1 to 32,464
- The address of the first word: from 0 to 32,463
- The number of bits (%M): from 1 to 32,634
- The address of the first bit: from 0 to 32,633

NOTE: The word tables and bit tables are found in the PLC internal memory. Any crossover between two areas of each table is prohibited. The bits area for the inputs cannot overlap the bits area for the outputs. The words area for the inputs cannot overlap the words area for the outputs.

⚠ WARNING

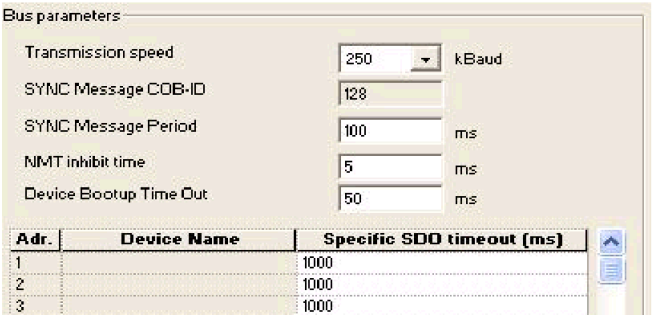
UNEXPECTED EQUIPMENT OPERATION

Verify, in case of a CANopen bus interruption, the fallback positions of all devices on the bus are as expected. Consult the relevant equipment's documentation for additional information.

Failure to follow these instructions can result in death, serious injury, or equipment damage.

Bus Parameters

The figure below illustrates the bus parameters configuration area:



To configure the bus, it is necessary to indicate:

- the transmission speed *(see Premium and Atrium using Unity Pro, CANopen Field Bus, User manual)*: 250kBauds default,
- the COB-ID of the synchronization message: 128 default,
- the synchronization message period: 100 ms default.
- the NMT inhibit time: 5 ms default. During Bootup, the CANopen Master implements a delay between each NMT messages to avoid slave overload. The value must be given in multiple of 100 µs. The value 0 disables the inhibit time.
- the Device Bootup Time Out: 50 ms default. The global SDO timeout for the master is related to the scanning of the network. During this time, the master reads the object 1000 of each slave to analyze the CANopen bus configuration.
- the Specific SDO timeout: 15000 ms default. The slaves SDO timeout is necessary for devices with long response times i.e. for accesses to the objects 1010,1011,1F50. A grid displays all present devices with the NodeId, the name and the timeout value.

Language Objects

The parameters presented below are represented in the %KW language objects:

Read	Parameter	Language object
Inputs	Number of words %MW	%KW8
	Index of the first word	%KW10
	Number of bits %M	%KW4
	Index of the first bit	%KW6
Outputs	Fallback mode	%KW0 Least Significant Byte : 16#00, Bit 2 to 7= 0, and : ● Bit 0= 0 and Bit 1= 0: reset of outputs if task in STOP or HALT ● Bit 0= 1 and Bit 1= 0: maintain of outputs if task in STOP or HALT ● Bit 0= 0 and Bit 1= 1: bus in STOP if task in STOP or HALT
	Number of words %MW	%KW9
	Index of the first word	%KW11
	Number of bits %M	%KW5
	Index of the first bit	%KW7
Bus parameters	Transmission speed	%KW1
	SYNC message COB-ID	%KW2
	SYNC message period	%KW3

Catalog Manager Software Implementation

5

Subject of this chapter

This chapter describes the Catalog Manager Software Implementation.

What Is in This Chapter?

This chapter contains the following sections:

Section	Topic	Page
5.1	Catalog Manager Overview	100
5.2	Using the Catalog Manager	108
5.3	Catalog Manager Troubleshooting	144

5.1 Catalog Manager Overview

Subject of this section

This section presents the Catalog Manager overview

What Is in This Section?

This section contains the following topics:

Topic	Page
Catalog Manager Description	101
Catalog Manager Contents	104

Catalog Manager Description

Overview

The Catalog Manager is a software tool that allows management of CANopen devices in the Unity Pro catalog database.

The Catalog Manager is a separate software that can be used to:

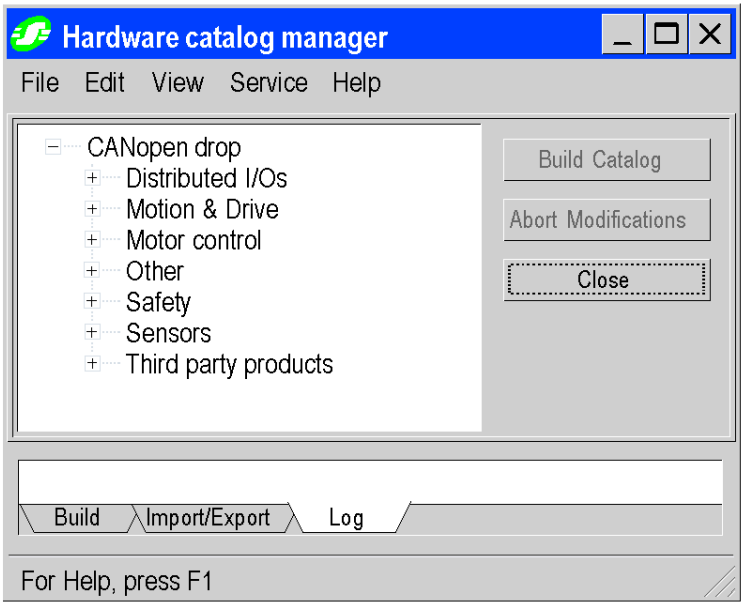
- Integrate third party products.
- Add, remove and configure access to CANopen devices on the fieldbus.
- Minimize the size of the CPU memory reserved for a given equipment.
- Customize the user interface.

The Unity user interface works on a catalog database which is installed with Unity Pro, and uses some basic services from the Unity Pro installation. Therefore Unity Pro software must be installed on your workstation, for the Catalog Manager to work.

NOTE: An overview of the Catalog Manager in read only mode is available in Unity Pro through the Hardware Catalog.

The devices are added in the standard catalog in Unity Pro and the devices can be used in projects as any devices that are provided with Unity Pro.

The following illustration shows the Catalog Manager main screen.



The output window has a context menu with the following information:

- Build: This is used to display information about the build progress.
- Import / export: This is used to display information about import / export.
- Log: This is used to display information and operational status during ‘Add Device’ or ‘Add Function’.

⚠ WARNING

RISK OF LOST APPLICATION

To avoid a complete reinstallation of Unity Pro Software and/or corrupting the STU files:

Do not interrupt a build of the Catalog Manager.

Failure to follow these instructions can result in death, serious injury, or equipment damage.

NOTE: The Catalog Manager is only available in English.

Only one instance of the Catalog Manager can be open at one time.

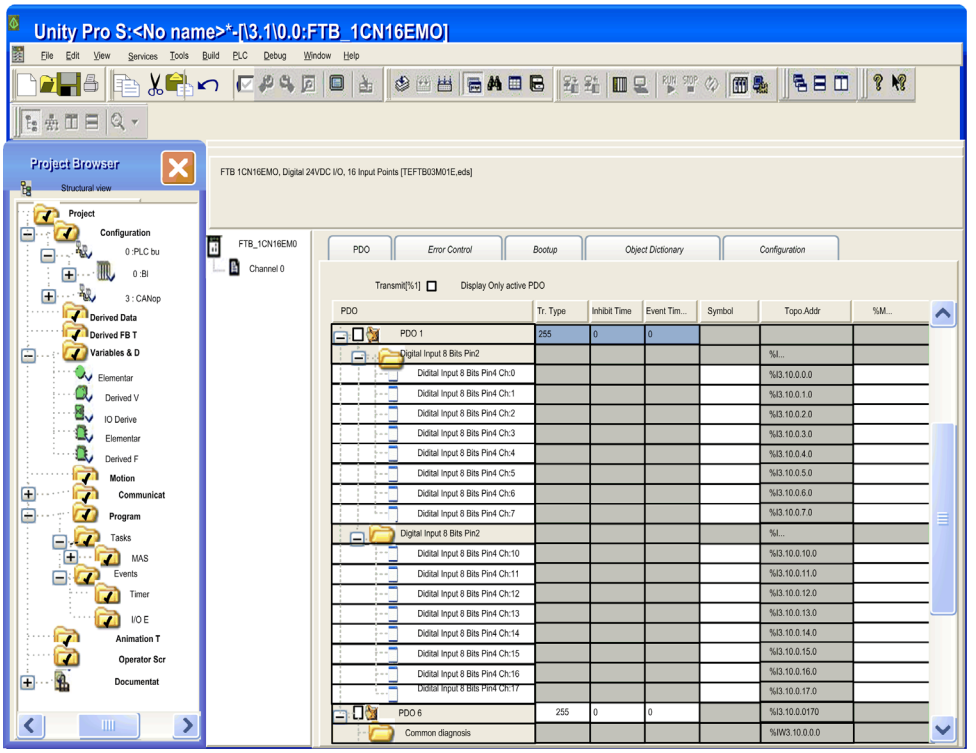
Description

These following catalog manager characteristics have to be taken into account during the development of the application:

- Multi-mapping is not authorized: you can not map the same variable several times in many active PDOs.
- Maximum CANopen object length is 32 bits. Bit type object variables are not supported, although bit type parameters are supported.

NOTE: If the non-supported objects are not mapped in a PDO, they will be deleted from the list and a warning message is generated. However, if these objects are mapped, the EDS file cannot be imported.

- A R/W variable must be mapped only once, either on a RX PDO or on a TX PDO.
- The CANopen module with profile V2.0B (coded COB-ID on 29 bits) is not supported. Profile V2.0A (coded COB-ID on 11 bits) is supported.
- Bitmapping: for an Input/ Output Module, you can configure it like an FTB device: each Input/Ouput is linked to a channel which can be associated to a topological address (bit). Therefore, it will be possible to retrieve and use the signal directly on this bit instead of extracting it from the %IW.



Catalog Manager Contents

Overview

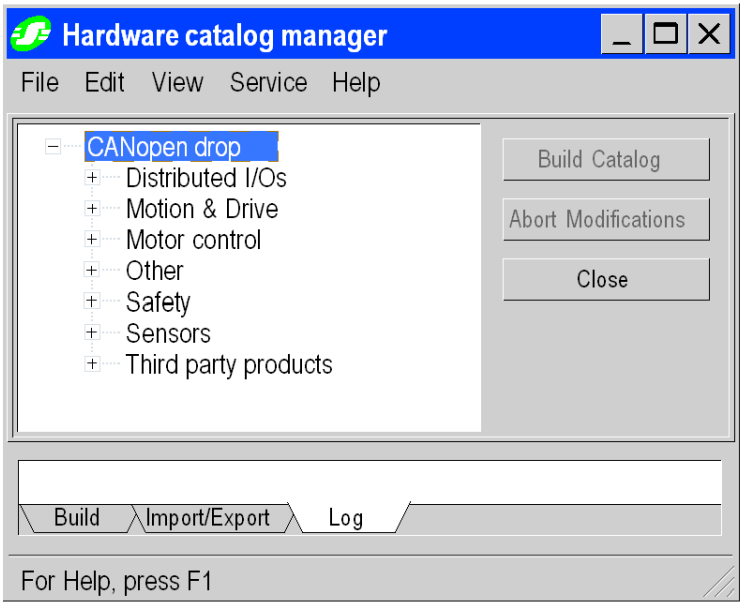
The Catalog Manager is composed of three levels of data:

- Device Families
- Devices
- Functions

Devices Families

The device families contain all the devices specific to each family: Distributed I/Os, Motion & Drive, Motor Control, Other, Safety, Sensors and Third party products.

The following illustration shows the different device families.



The item ‘View’ is a context menu with the following information:

- Status Bar: Show/Hide Status Bar.
- Output Window: Show/Hide Output Window.
- View Function: Display the selected function.

Devices

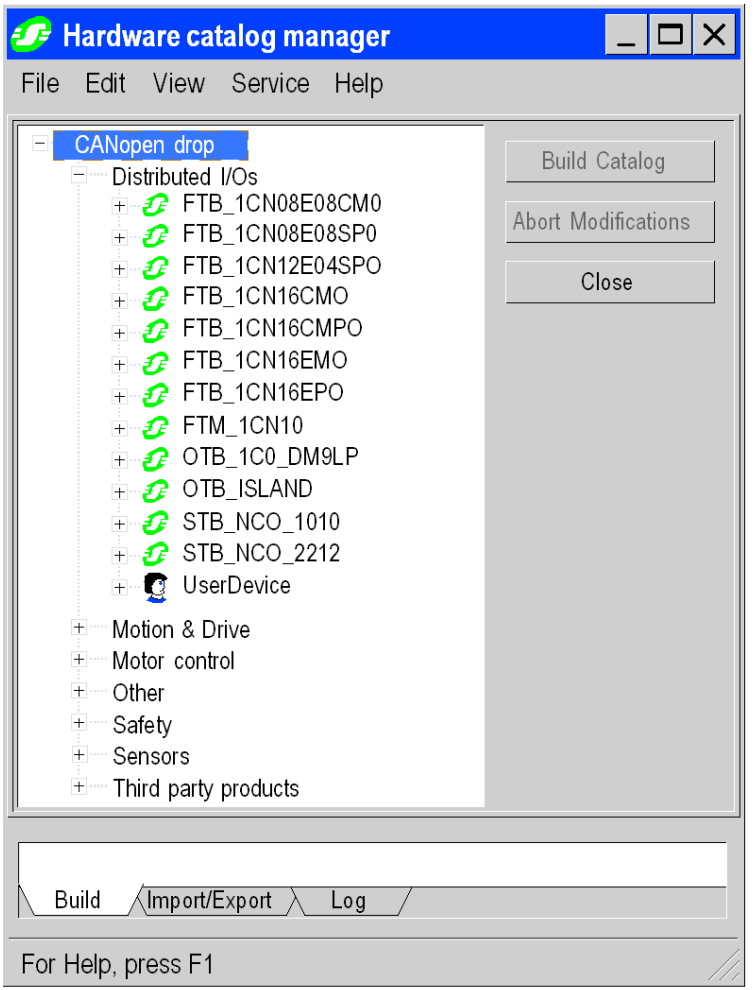
Devices are individual external units that may offer one or several different functions.

A device is identified in the catalog by its name. The default name is taken from the EDS file although this can be modified. The device name must be unique in the catalog.

There are two different kinds of device:

- Pre-programmed devices
  Information about these devices is included with Unity Pro software.
  The user cannot modify the list of pre-programmed devices. An icon with a Schneider logo is shown on the left of a Schneider device name.
- User devices
  Any device which is not part of the Schneider offer is considered to be a "User device".
  User devices can be deleted or reconfigured in the Catalog Manager. User devices that have been added but not yet built are shown with a icon. Devices that have been built are indicated with a icon.

The following illustration shows a list of Distributed I/O devices and one User device.



Functions

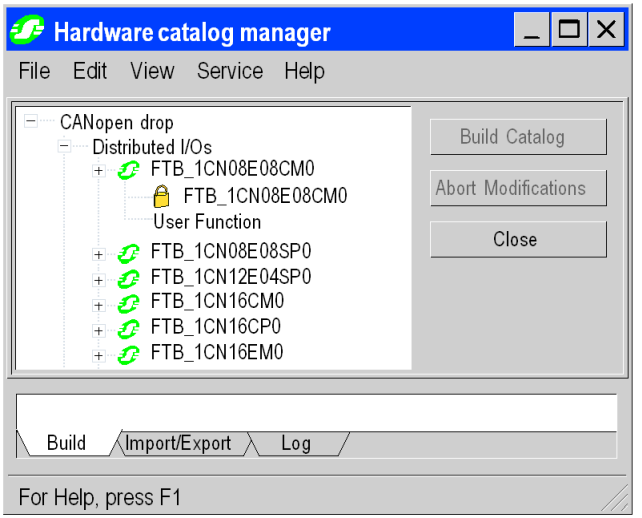
A function is a sub-category within a device. The user can create functions in order to use only a limited subset of capabilities for that device.

A default name is proposed for the first function although it can be modified. The function name must be unique within a given device. Each function has its own IODDT.

There are two different kinds of function :

- Pre-programmed function
  Information about these function is included with Unity Pro software.
  The user cannot modify a pre-programmed function, this is indicated by a padlock on the left of the function.
- User function
  Any function which is not part of the Schneider offer is considered to be a "User' function.
  User functions can be deleted or reconfigured in the Catalog Manager.

The following illustration shows a pre-programmed device with both pre-programmed and user functions,



Example :

Device Family : Distributed I/Os

Device : FTB_1CN08EOBCMO

Functions :

Default (write protected Schneider functions)

TestFunction (User functions)

5.2 Using the Catalog Manager

Subject of this section

This section presents the different steps to use the Catalog Manager.

What Is in This Section?

This section contains the following topics:

Topic	Page
How to launch the Catalog Manager	109
How to add a device to the Catalog Manager	110
How to add a function on a device	113
Basic configuration parameters	115
Expert Mode configuration parameters	119
MFB function for Expert Mode	131
CANopen Compatibility Restrictions	137
How to copy or delete a function	138
How to import/export or delete one or several user devices	139
How to close the Catalog Manager	142
Example of how to create a dedicated and optimized STB Island	143

How to launch the Catalog Manager

At a glance

This is the procedure to launch the Catalog Manager.

NOTE: Catalog Manager and Unity Pro software cannot both be running at the same time.

Procedure

The table below shows the procedure to launch the Catalog Manager

Step	Action
1	Verify that Unity Pro software is not running ● if Unity Pro Software is running, close it ● if Unity Pro Software is not running, go to the next step
2	Select: Start ->Programs->Schneider Electric->Unity Pro->Hardware Catalog Manager

How to add a device to the Catalog Manager

At a glance

This is the procedure to add a device to the Catalog Manager.

⚠ WARNING

UNINTENDED EQUIPMENT OPERATION

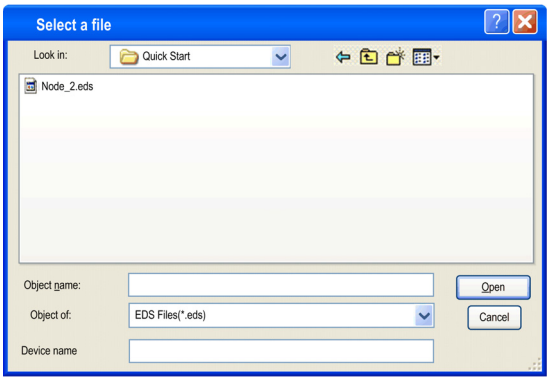
Verify with your device supplier that the EDS or DCF file is compatible with the firmware version of the product.

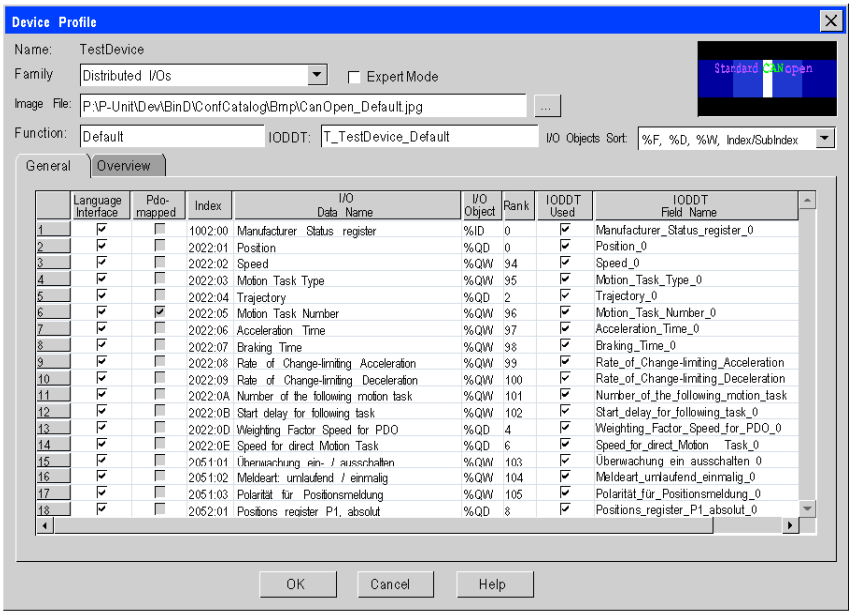
Failure to follow these instructions can result in death, serious injury, or equipment damage.

Procedure

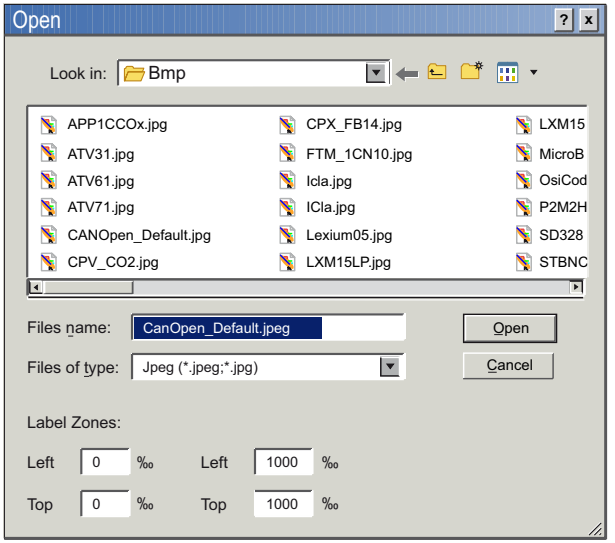
New devices are added to the Catalog Manager using EDS or DCF files (a DCF file can be used in certain cases, for example, for Modicon TM5 IP20 and TM7 IP67 Distributed Performance I/O).

Before starting the procedure in the following table, it is necessary to know the name and location of the EDS or DCF file corresponding to the new device to be added.

Step	Action
1	Open the Catalog Manager.
2	• Select Edit->Add Device OR • Right-click on a device family. • Select 'Add Device'
3	A windows dialog box appears to select the EDS or DCF file to import *(see page 150)*: 

Step	Action
4	• Select the EDS or DCF file name corresponding to the device that is to be added • Enter a unique name for the device (optional). Only one EDS or DCF file can be selected at a time - multiple selections are not permitted. By default, the name of the EDS or DCF file is used as device name although it can be modified. The device name cannot be changed after this step.
5	A screen appears showing the new device parameters. An example is shown here:  In this tab, you can sort the objects in different ways: either clicking on the column head or ticking the checkboxes then clicking on the column head again.

	Language Interface	Pdo-mapped	Index	I/O Data Name	I/O Object	Rank	IODDT Used	IODDT Field Name
1	☑	☐	1002:00	Manufacturer Status register	%ID	0	☑	Manufacturer_Status_register_0
2	☑	☐	2022:01	Position	%QD	0	☑	Position_0
3	☑	☐	2022:02	Speed	%QW	94	☑	Speed_0
4	☑	☐	2022:03	Motion Task Type	%QW	95	☑	Motion_Task_Type_0
5	☑	☐	2022:04	Trajectory	%QD	2	☑	Trajectory_0
6	☑	☑	2022:05	Motion Task Number	%QW	96	☑	Motion_Task_Number_0
7	☑	☐	2022:06	Acceleration Time	%QW	97	☑	Acceleration_Time_0
8	☑	☐	2022:07	Braking Time	%QW	98	☑	Braking_Time_0
9	☑	☐	2022:08	Rate of Change-limiting Acceleration	%QW	99	☑	Rate_of_Change-limiting_Acceleration
10	☑	☐	2022:09	Rate of Change-limiting Deceleration	%QW	100	☑	Rate_of_Change-limiting_Deceleration
11	☑	☐	2022:0A	Number of the following motion task	%QW	101	☑	Number_of_the_following_motion_task
12	☑	☐	2022:0B	Start delay for following task	%QW	102	☑	Start_delay_for_following_task_0
13	☑	☐	2022:0D	Weighting Factor Speed for PDO	%QD	4	☑	Weighting_Factor_Speed_for_PDO_0
14	☑	☐	2022:0E	Speed for direct Motion Task	%QD	6	☑	Speed_for_direct_Motion Task_0
15	☑	☐	2051:01	Überwachung ein- / ausschalten	%QW	103	☑	Überwachung ein ausschalten 0
16	☑	☐	2051:02	Meldeart: umlaufend / einmalig	%QW	104	☑	Meldeart_umlaufend_einmalig_0
17	☑	☐	2051:03	Polarität für Positionsmeldung	%QW	105	☑	Polarität_für_Positionsmeldung_0
18	☑	☐	2052:01	Positions register P1, absolut	%QD	8	☑	Positions_register_P1_absolut_0

Step	Action
6	Some parameters on the device profile screen can be changed by the user: ● Family: select the device family from the list. ● Image File: select the image file (BMP or JPG format) associated to the device which will be displayed in the graphical Catalog Manager Configurator Editor. There is no limit to the size of the image. In the boxes included in the label zone, you define the device name position compared to the bitmap position..  ● Expert Mode: Expert Mode Configuration Parameters *(see page 119)*. To configure the function parameters, Basic Configuration Parameters *(see page 115)* and Expert Mode Configuration Parameters *(see page 119)*. When all configuration parameters are set as required, click OK.
7	Return to the Catalog Manager main screen and click on the button ‘Build Catalog’ in order to save any changes, and to load the new device into the Catalog Manager database. A window appears showing the progress of the catalog build. When the build is complete, the device is indicated with a icon.

How to add a function on a device

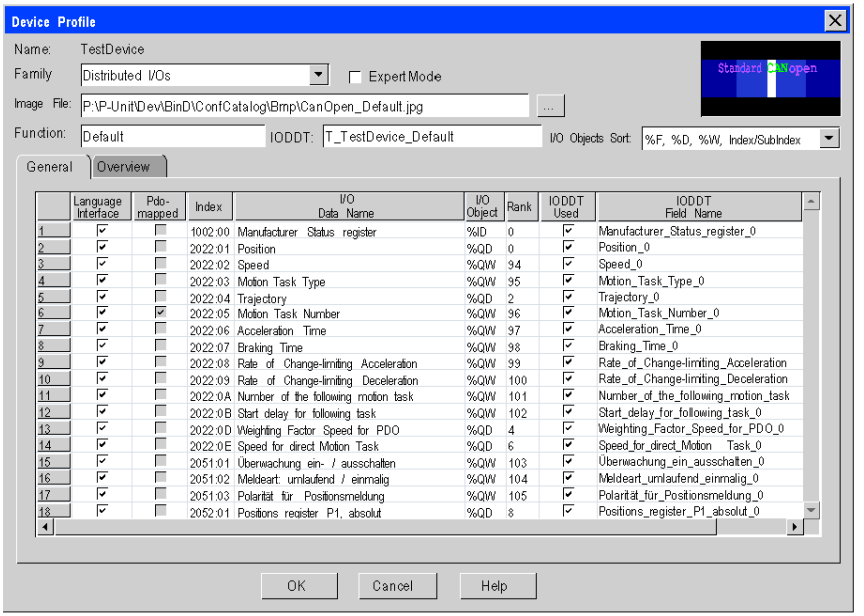
At a glance

This procedure describes how to add a function to an existing device in the Catalog Manager. Adding a function on a device allows the user to access a limited subset of capabilities on the device.

Procedure

The table belows shows the procedure to add a function and access the configuration screen:

Step	Action
1	Open the Catalog Manager.
2	There are different ways to access the configuration screen: ● Right-click on a device. Select ‘Add Function" OR ● Select a device in the Catalog Manager. Select Edit->Add Function

Step	Action
3	The window below appears showing the basic configuration parameters:  To configure the function parameters, Basic Configuration Parameters *(see page 115)*,Expert Mode Configuration Parameters *(see page 119)*.
4	When configuration is complete, click OK. Return to the Catalog Manager main screen and click on the button 'Build Catalog' in order to save any changes and to load the new function into the Catalog Manager database.

Basic configuration parameters

At a glance

The basic configuration parameters can be set in the Device Profile screen, using the General and Overview tabs.

Function parameters

The user can customize the function which has been added to the Catalog Manager, in order to select the specific capabilities required.

Before starting the configuration, be aware of the following rules:

- Each function name must be unique within a device. The name of the default function is "Default" although it can be modified by the user.
- An IODDT is generated for the function if at least one of the variables in the grid is checked for usage in IODDT.
- The IODDT name must be unique in the whole catalog. By default, it is derived by combining the device name and the function name preceded by "T_". The user can modify the IODDT name, but the new name must be unique.
- Predefined or user defined IODDTs cannot be reused. However, they can be duplicated with new names.

The configuration parameters can be sorted by I/O objects using a pull-down menu. The list of available sort modes are:

- Object Sort 1 - Type and Index/Sub Index:
  I/O are sorted by type (%F,%D,%W) and by index and Sub Index in each type.
- Object Sort 2 - PDOs order:
  I/O are sorted by type (%F,%D,%W) and by PDO order in each type for unmapped object.
- Object Sort 3 - Index/Sub Index:
  I/O are sorted by index and Sub Index.

The following illustration shows examples of I/O object allocation for the three sort types listed above:

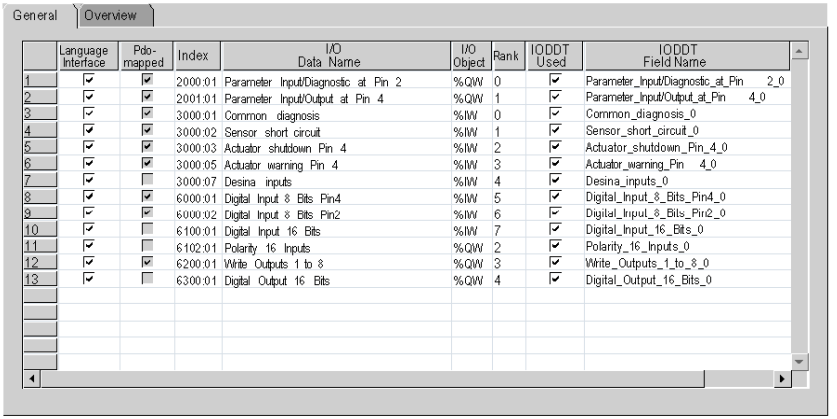
Objects Dictionary	Type	PDO Mapping	I/O Object	Sort 1		I/O Object	Sort 2		I/O Object	Sort 3	
0x2004:06	%IW	Tx1.1	0x3000:04	%IF	0	0x2004:06	%IW	0	0x2004:06	%IW	0
0x2004:07	%IW	Tx1.2	0x3000:03	%ID	4	0x2004:07	%IW	1	0x2004:07	%IW	1
0x2008:01	%QW	Rx1.1	0x2004:06	%IW	6	0x3000:04	%IF	2	0x3000:03	%ID	2
0x2008:05	%QW	Rx1.2	0x2004:07	%IW	7	0x3000:03	%ID	6	0x3000:04	%IF	4
0x3000:02	%QF	Rx4.1	0x3000:02	%QF	0	0x2008:01	%QW	0	0x2008:01	%QW	0
0x3000:01	%QD	Rx4.2	0x3000:01	%QD	4	0x2008:05	%QW	1	0x2008:05	%QW	1
0x3000:04	%IF	Tx4.1	0x2008:01	%QW	6	0x3000:02	%QF	2	0x3000:01	%QD	2
0x3000:03	%ID	Tx4.2	0x2008:05	%QW	7	0x3000:01	%QD	6	0x3000:02	%QF	4

NOTE: Tx 1.2: Object mapped on Transmission PDO number 1, position 2.

Rx 1.2: Object mapped on Reception PDO number 1, position 2.

General tab

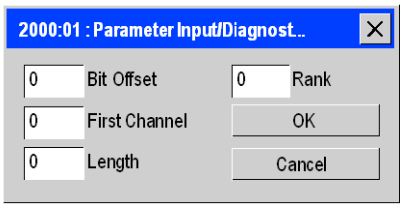
The General tab shows the list of all mappable variables found in the EDS file.



	Language Interface	Pdo-mapped	Index	I/O Data Name	I/O Object	Rank	IODDT Used	IODDT Field Name
1	☑	☑	2000:01	Parameter Input/Diagnostic at Pin 2	%QW	0	☑	Parameter_Input/Diagnostic_at_Pin 2_0
2	☑	☑	2001:01	Parameter Input/Output at Pin 4	%QW	1	☑	Parameter_Input/Output_at_Pin 4_0
3	☑	☑	3000:01	Common diagnosis	%IW	0	☑	Common_diagnosis_0
4	☑	☑	3000:02	Sensor short circuit	%IW	1	☑	Sensor_short_circuit_0
5	☑	☑	3000:03	Actuator shutdown Pin 4	%IW	2	☑	Actuator_shutdown_Pin_4_0
6	☑	☑	3000:05	Actuator warning Pin 4	%IW	3	☑	Actuator_warning_Pin 4_0
7	☑	☐	3000:07	Desina inputs	%IW	4	☑	Desina_inputs_0
8	☑	☑	6000:01	Digital Input 8 Bits Pin4	%IW	5	☑	Digital_Input_8_Bits_Pin4_0
9	☑	☑	6000:02	Digital Input 8 Bits Pin2	%IW	6	☑	Digital_Input_8_Bits_Pin2_0
10	☑	☐	6100:01	Digital Input 16 Bits	%IW	7	☑	Digital_Input_16_Bits_0
11	☑	☐	6102:01	Polarity 16 Inputs	%QW	2	☑	Polarity_16_Inputs_0
12	☑	☑	6200:01	Write Outputs 1 to 8	%QW	3	☑	Write_Outputs_1_to_8_0
13	☑	☐	6300:01	Digital Output 16 Bits	%QW	4	☑	Digital_Output_16_Bits_0

NOTE: A left click on the header of each column can be used to sort the grid (first click ascending order/second click descending order).

The following information is listed for each variable:

Name	Description
Line number	The user can have more information via a right-click on the "Line Number" column: • Set as parameter: This converts the variable to a parameter. • Set Bit Mapping: This opens a dialog box to define the bit mapping. The bit mapping creates a boolean view of the CANopen object mapped on the %I or %Q topological variable.  • Reset Bit Mapping: This resets bit mapping of the variable.
Language Interface	If checked, the variable will have a language interface. Therefore, this variable can be used in the program and its value is displayed in the debug screen. If unchecked, the variable will be unavailable. To minimize the amount of memory needed for the function, it is useful to uncheck variables which are not required by the user. All variables are checked by default. The user can check or uncheck all variables in the column by a right-click. All "Language Interface" variables have a static language interface defined in the catalog.

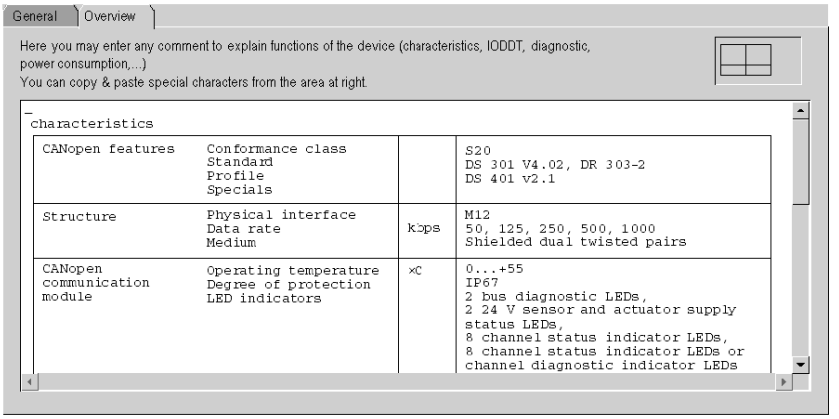
Name	Description
PDO Mapped (not modifiable)	This indicates if the variable is currently mapped to a PDO. It can be changed in the expert mode (refer to expert mode configuration parameters). The default function uses the PDO mapping defined in the EDS file. The check box for ‘PDO Mapped’ variables is not directly modifiable by the user but it is refreshed if the user removes a variable by unchecking it from the ‘Language Interface" list, the ‘PDO-Mapped’ check box is unchecked.
Index (not modifiable)	This indicates the CANopen index parameter.
I/O Data Name (not modifiable)	This is the parameter name found in the EDS file.
I/O Object	Access type (%I,%Q), data type (W,D,F) and rank of the I/O data in topologic syntax. The rank is calculated from the list of language interface variables and is updated each time the list of language interface variables changes. The "I/O Object" field is empty if the "Language Interface" checkbox is not checked.
IODDT Used	If checked this data will be a field of the related IODDT. This check box is modifiable only if the "Language interface" checkbox is checked. Otherwise it is unchecked. The user can select or deselect all variables in the column by a right-click.
IODDT Field Name	Name of the IODDT field. By default, this is the name of the I/O data with spaces and special characters replaced by underscores. Numbers may be added if the name is not unique in the IODDT. This name is displayed and can be modified by the user only if "IODDT Used" is checked.

NOTE: When the "Device Function" screen opens, all PDO-mappable variables are checked as "Language Interface" and for IODDT usage. Only variables that are mapped by default in the EDS file are checked as "PDO-mapped’.

Overview tab

In this screen, the user can enter a text description of the device and the related functions. It will be displayed in the Unity Module Editor.

The following illustration shows an example overview tab:



The entry field can be filled by the user. It is possible to draw grid lines by copying special characters from the top right area in the windows.

Expert Mode configuration parameters

At a glance

This paragraph speaks about the Expert Mode configuration parameters.

The ‘Expert Mode’ check box has to be selected to get the Expert Mode configuration parameters.

The Expert Mode configuration parameters are used to:
- Remove variables
- Change variables mapping
- Modify variables parameters
- Substitute the standard bootup procedure for devices which do not comply with CANopen standards
- Display in read-only mode the content of the EDS used to build the device

The Expert Mode configuration parameters are composed of five tabs:
- PDO mapping tab
- Parameters tab
- Bootup Procedure tab
- Object Dictionary tab
- EDS tab

NOTE: Configuring a device using one of the five tabs of the Expert mode will only be available on CPU 20102 or 20302.

NOTE: Bootup procedure and Object Dictionary tabs are provided for CANopen expert users. Configuration changes via these tabs can result in incorrect configuration of the device, which can disturb the CANopen bus.

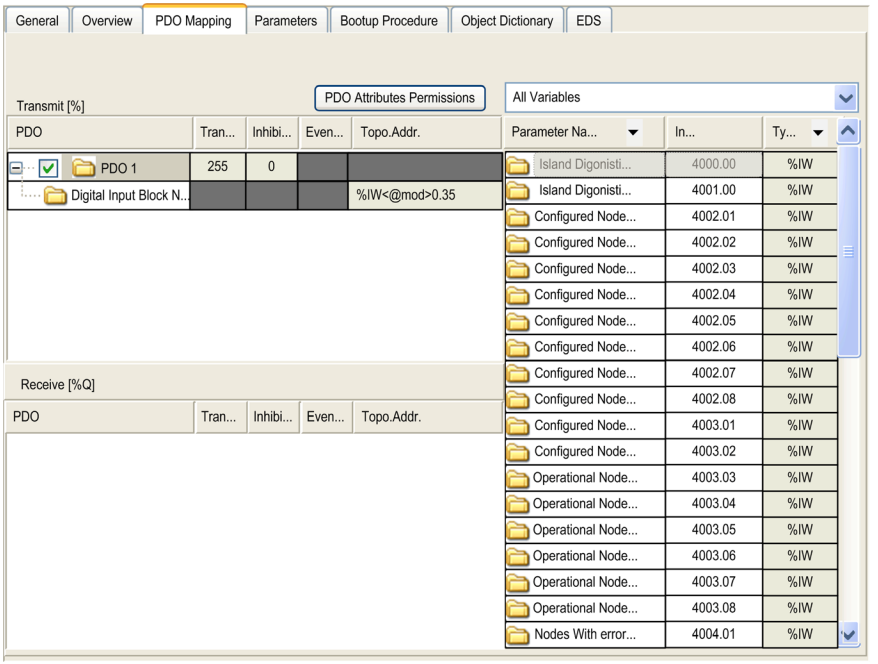
PDO Mapping

The PDO mapping tab opens a CANopen expert screen for PDO configuration.

The PDO mapping configuration is composed of three parts:

- Transmit PDOs.
- Receive PDOs.
- Variables.

The following illustration describes the PDO Mapping tab:



Parameters for transmit and receive PDOs are initialized with the default PDO mapping found in the EDS.

This default configuration can be changed by the user:

- PDOs can be enabled or disabled (by checking / unchecking them).
- Variables can be mapped or unmapped using drag and drop mechanism between PDOs and the variable windows.
- Transmission type, Inhibit time, Event timer of each PDO can be changed.
  If the properties are not available for the PDO, cells are painted in dark grey and are not editable. A message box is displayed if the user enters a value of transmission not authorized.
  Implicit rules of transmission are:

- Values between 241-251 are not available since they are reserved value.
- Values 252/253 are not supported.
- Values between 0-240 are not available if the device doesn't support synchronous communication.

NOTE: Inhibit time and Event timer are always disabled for PDO in reception.

The Topo.Adrr field cannot be changed by the user.

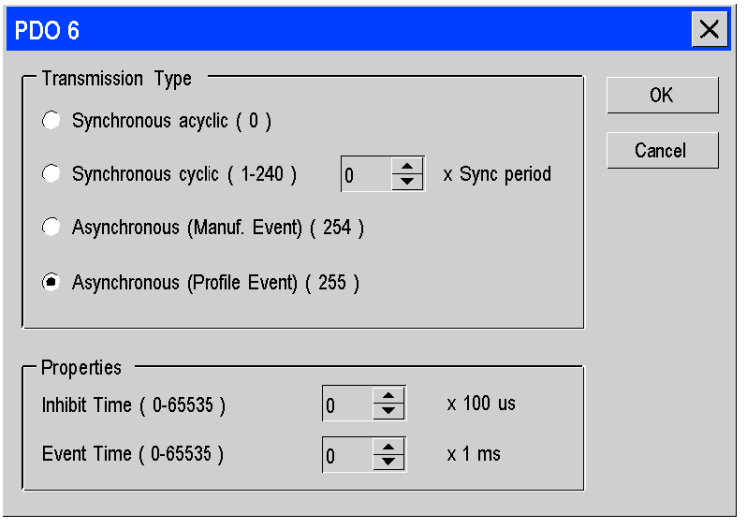
The Catalog Manager calculates the fixed part of the topologic address for mapped variables:
- Access type.
- Data type.
- Channel number.
- Rank.

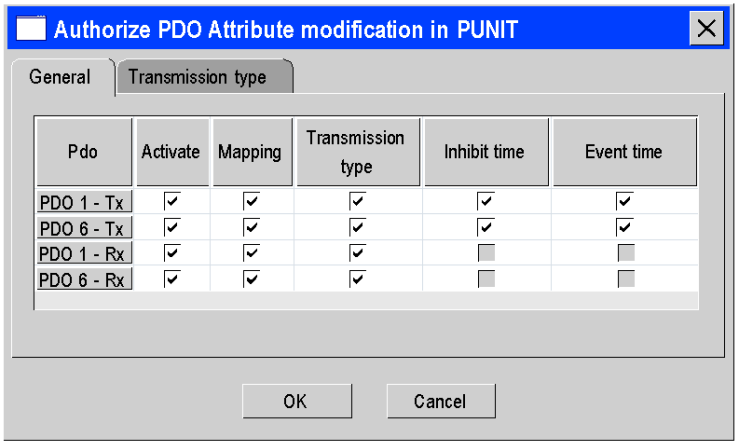
The module address is known only when the device is instantiated in an application. Therefore the catalog expert screen shows "<@mod>" instead of the real module address.

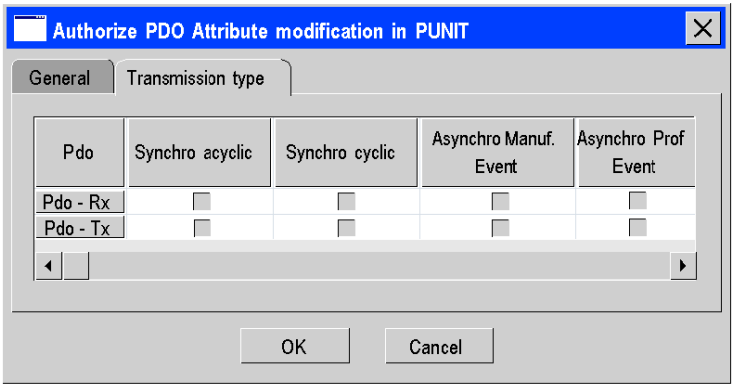
NOTE: Variables can be mapped to a PDO even if it is disabled. In this case, these variables still have a memory address (static memory mapping) but they will not exchange on the bus and a warning message is shown on analyzing the application.

The user can access to different menus on the PDO Mapping tab:

Name	Description
1.Drag and drop of variables	Drag and drop of variables on the PDO Mapping tab is possible: ● Inside the same PDO to another position. ● From one PDO to another of the same type (Transmit and Receive). ● From a PDO to the variables window (unmap this variable).. ● From the variables windows to a PDO if access type and PDO type are compatible and if the amount of the memory needed for the PDO will not exceed the limit of 8 bytes. ● Inside the same PDO to another position. ● Inside the same PDO to another position.

Name	Description
2.Transmission type, Inhibit time and Event timer	A double click on these columns opens the following screen:  Inhibit Time and Event Time are accessible only if an asynchronous transmission type has been chosen. The unauthorized values of ‘Transmission Type’ must be disabled according to the PDO attributes.

Name	Description
3. PDO attributes permissions	This is used to define general access right attributes of PDO. These attributes are used in Unity Pro CANopen screen and in the Catalog Manager to authorize or not the modification of PDO. The following illustration shows the general PDO attributes screen:  The grid is initialized with the list of all PDO found in the device and the followig information is displayed for each PDO: ● PDO: This is the list of available PDO (TX and RX) and it is not modifiable. ● Activate: If checked then the PDO can be activated.Thus associated PDO can be enabled or disabled in Unity Pro CANopen screen. ● Mapping: If checked then mapping is editable in UnityPro CANopen screen. ● Trans Type: If checked, then 'Transmission type' value will be editable in Unity Pro CANopen screen. Other constaints can be defined in the 'Transmission Type' tab. ● Inhibit Time: If checked, then 'Inhibit time' value will be editable in Unity Pro CANopen screen. ● Event time: If checked, then 'Event time' value will be editable in Unity Pro CANopen screen .

Name	Description
4.'Transmission type ' range of PDO-Tx and PDO-Rx	'Transmission type' range of Tx PDO and Rx PDo can be defined by the user. the following illustration shows the Transmission type screen for PDO attributes:  The grid is initialized with attributes of Tx PDO and Rx PDO and the followig information is displayed for each PDO: ● PDO: This is the RX PDO and Tx PDO. It is not modifiable. ● Synchronous acyclic: If checked then synchronous acyclic Transmission Type range is available in Unity Pro. ● Synchronous cyclic: if checked then synchronous cyclic Transmission Type range is available in Unity Pro. ● Asynchronous Manuf Event: if checked then asynchronous manuf. Event Transmission Type range is available in Unity Pro. ● Asynchronous Profile Event: if checked then asynchronous profile event Transmission Type range is available in Unity Pro.

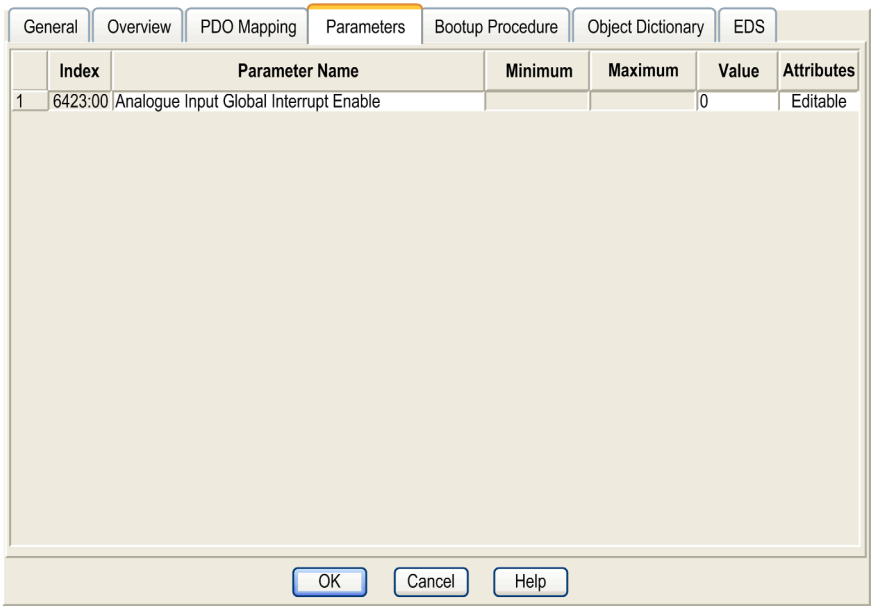
Parameters tab

The parameters tab is used to modify the properties of parameters.

The properties of parameters are:

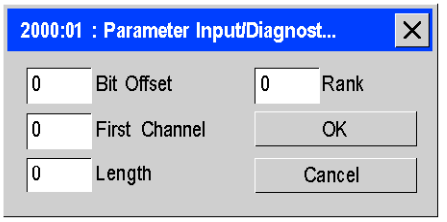
- Index: indicates the index and the sub-index of the parameter (not editable).
- Parameter name: indicates the name of the parameter (not editable).
- Minimum/Maximum: indicates the range of authorized value (not editable).
- Value: indicates the parameter value (editable) and is initialized with the default value find in the EDS.
- Attribute:
  - Editable: The parameter is editable in Unity Pro CANopen screen (default value).
  - Read only: The parameter is visible in Unity Pro but not editable.
  - Hide: The parameter is not visible in Unity Pro but the value is sent to the device.

The following illustration shows the parameters tab:



The user can have more information via a right-click on the "Line Number" column:

- Set as parameter: This converts the variable to a parameter.
- Set Bit Mapping: This opens a dialog box to define the bit mapping.
  The bit mapping creates a boolean view of the CANopen object mapped on the %I or %Q topological variable.



- Reset Bit Mapping: This resets bit mapping of the variable.
- Move up and Move down: This can be used to sort the parameters in the Unity Pro configuration screen.

Bootup Procedure Tab

The goal of bootup procedure tab is to bypass the standard bootup procedure for devices which do not comply with CANopen standards

⚠ WARNING

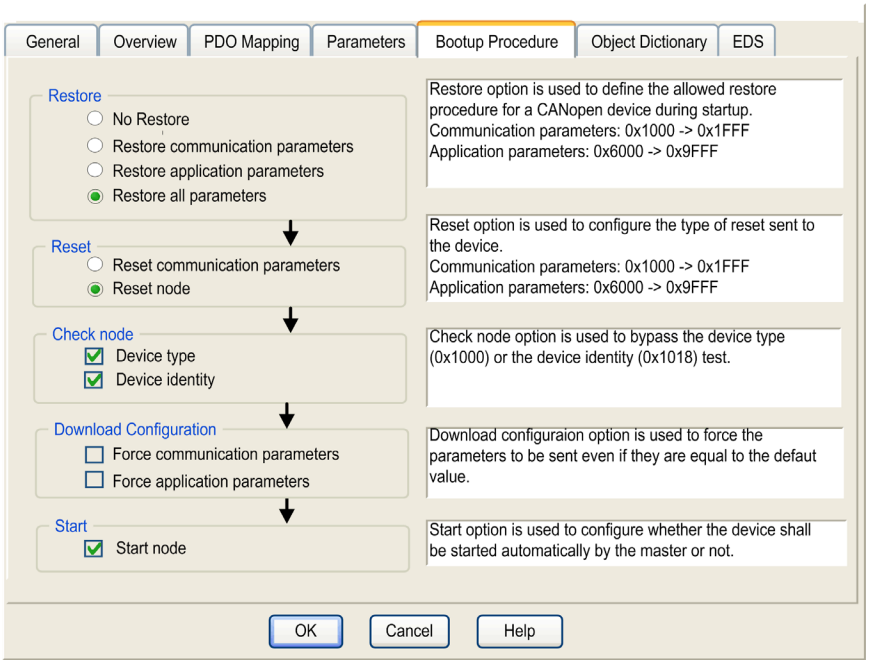
UNEXPECTED EQUIPMENT OPERATION

Manually verify all deactivated standard checks on the device before operating the system.

Changing the default parameters of the Boot Up Procedure tab will bypass standard system checks.

Failure to follow these instructions can result in death, serious injury, or equipment damage.

The following illustration describes the Bootup Procedure tab:


General
Overview
PDO Mapping
Parameters
Bootup Procedure
Object Dictionary
EDS
Restore
No Restore
Restore communication parameters
Restore application parameters
Restore all parameters
Restore option is used to define the allowed restore procedure for a CANopen device during startup.
Communication parameters: 0x1000 -> 0x1FFF
Application parameters: 0x6000 -> 0x9FFF
Reset
Reset communication parameters
Reset node
Reset option is used to configure the type of reset sent to the device.
Communication parameters: 0x1000 -> 0x1FFF
Application parameters: 0x6000 -> 0x9FFF
Check node
Device type
Device identity
Check node option is used to bypass the device type (0x1000) or the device identity (0x1018) test.
Download Configuration
Force communication parameters
Force application parameters
Download configuraion option is used to force the parameters to be sent even if they are equal to the defaut value.
Start
Start node
Start option is used to configure whether the device shall be started automatically by the master or not.
OK
Cancel
Help

- The type of restore:
  - No Restore: option enabled by default.
  - Restore communication parameters: enabled option according to the object 0x1011sub02. If the option is checked, all parameters between 0x1000 to 0x1FFF are restored.
  - Restore application parameters: enabled option according to the object 0x1011sub03. If the option is checked and if the device correctly implements the service, all application parameters are restored.
  - Restore all: enabled option according to the object 0x1011sub01. If the option is checked, all parameters are restored (default value).
- The type of reset:
  - Reset communication parameters: option always enabled. If the option is checked, all communication parameters are reset.
  - Reset node (default value): option always enabled. If the option is checked, all parameters are reset.
- The check device type and identity (checked by default):
  - If the device type identification value for the slave in object dictionary 0x1F84 is not 0x0000 ("don't care"), compare it to the actual value.
  - If the configured Vendor ID in object dictionary 0x1F85 is not 0x0000 ("don't care"), read slave index 0x1018, Sub-Index 1 and compare it to the actual value.
  - The same comparison is done with ProductCode, RevisionNumber and SerialNumber with the according objects 0x1F86-0x1F88.

NOTE: Unchecked option DeviceType forces the object dictionary 0x1F84 to 0x0000.

NOTE: Unchecked option identity forces the object dictionary 0x1F86-0x1F88 (sub device nodeID) to 0x0000.

- Force the download of communication or configuration parameters (unchecked by default). If option is checked, it forces all the corresponding objects to be downloaded.
  If the option is unchecked, you must follow these standard rules:
  - Parameters are downloaded if they are different from the default value.
  - Parameters are downloaded if they are forced in the object dictionary.
  - Parameters are not downloaded in the other cases.
- The Start Node:
  If option is checked (default value), the CANopen master starts automatically the device after the bootup procedure.
  If option is unchecked, the device stays in pre-operational state after bootup procedure. In this case, the device must be started by the application program.

Object Dictionary Tab

⚠ WARNING

UNEXPECTED EQUIPMENT OPERATION

Manually verify all Object Dictionary values.

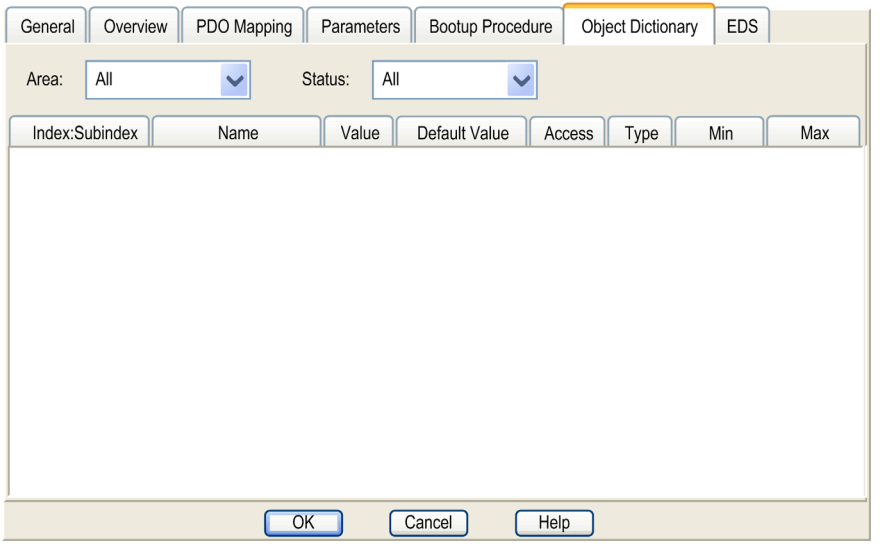
Changing the default values of the Object Dictionary table will generate non-standard behaviour of the equipment.

Failure to follow these instructions can result in death, serious injury, or equipment damage.

The object dictionary screen is a CANopen Expert editor, and allows to:

- Force parameters to be transmitted even if they are unchanged.
- Suppress parameters that do not need to be sent to the device.
- Set objects to a specific value just before (prologue), or just after (epilogue) the standard boot up procedure.
- Modify the current value of an object (except read only objects).

The following illustration describes the Object Dictionary tab:



You can select 2 filters to reduce the number of displayed objects on the grid:

Area filter	
All	show all area
Prologue/Epilogue	show only prologue and epilogue projects
[XXXX...XXXX]	show only objects between XXXX to XXXX
Status filter	
All	show all objects
Configured	show only transmitted objects to the device during boot up
Not Configured	show only not transmitted objects to the device
Modified	show only objects from which values are different from default values

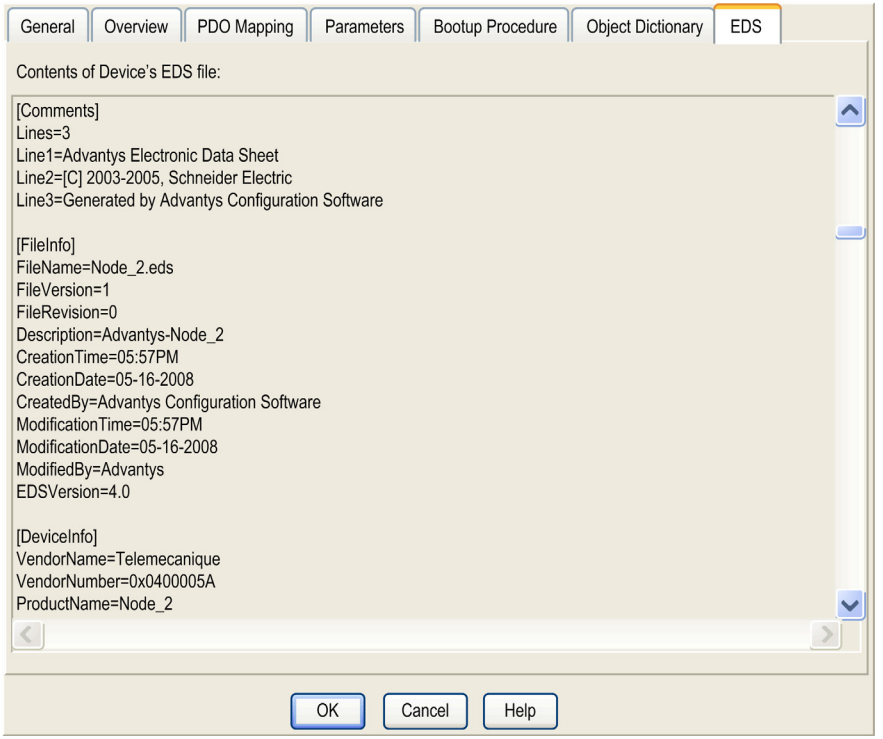
You can right click on an object to execute function:

Right click on an object in the prologue and epilogue sections	
Cut	Cut the row and copy the object in the clipboard
Copy	Copy the object in the clipboard
Paste	Paste the object in the selected row
Delete	Delete the selected object
Move up	Used to manage the order of the list
Move down	Used to manage the order of the list
Configured	If checked, the object is transmitted to the device
Expand all	Expand all nodes of the tree
Collapse all	Collapse all nodes of the tree
Right click on an object in the standard sections	
Copy	Copy the object in the clipboard
Configured	If checked, the object is transmitted to the device
Expand all	Expand all nodes of the tree
Collapse all	Collapse all nodes of the tree

EDS tab

The EDS tab displays in read-only mode the content of the EDS used to build the device.

The following illustration shows the EDS tab:



MFB function for Expert Mode

Function Creation

Before configuring your MFB function, create it by following this guideline:

Step	Action
1	In the Hardware Catalog Manager, select the CANopen Motion & Drive node, then select the drive you wish, ATV71_V1_1 for example.
2	Select the MFB function, then execute the copy function after a right click.
3	Select again the CANopen drive node (ATV71_V1_1), then execute the paste function after a right click.

IODDT Creation

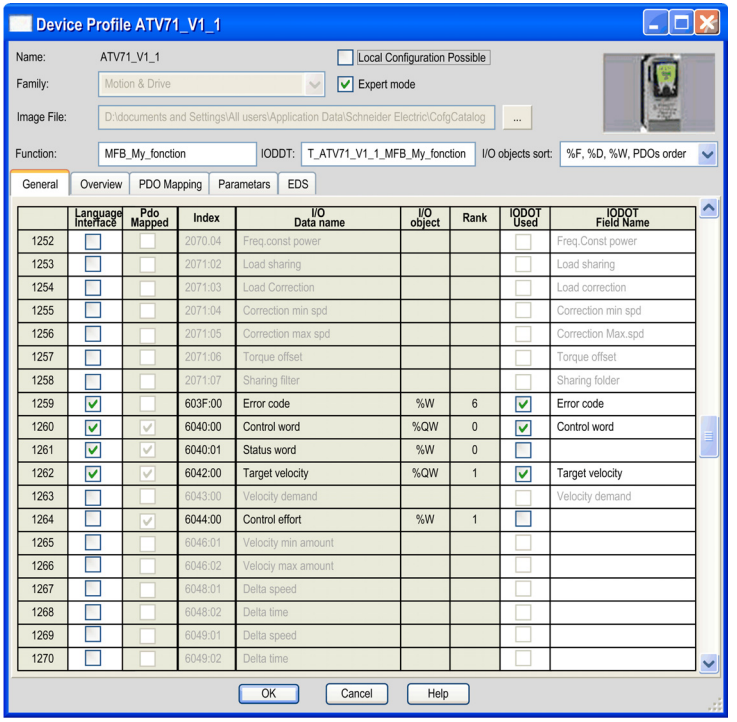
After the paste function, the Device Profile ATV71_V1_1 Dialog Box appears:

Step	Action
1	Tick Expert Mode check box.
2	Select %F %D % W...PDOs Order in the I/O Objects Sort box.
3	Type the function name you wish in the Function box, MFB_My_Function for instance. **NOTE:** The function name must begin with MFB_
4	The IODDT with the name T_ATV71_V1_1_MFB_My_Function is automatically created.It is shown on the IODDT box.

Objects Selection

Now, you have to select your objects:

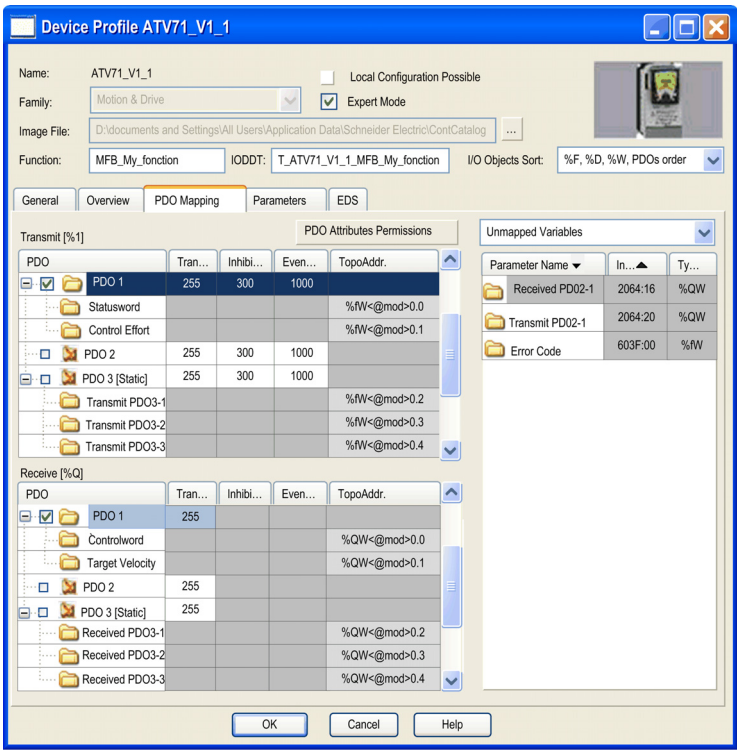
Step	Action
1	Select the General tab in the Device Profile ATV71_V1_1 Dialog Box.
2	Select the objects you wish by ticking them in the Language Interface Column.

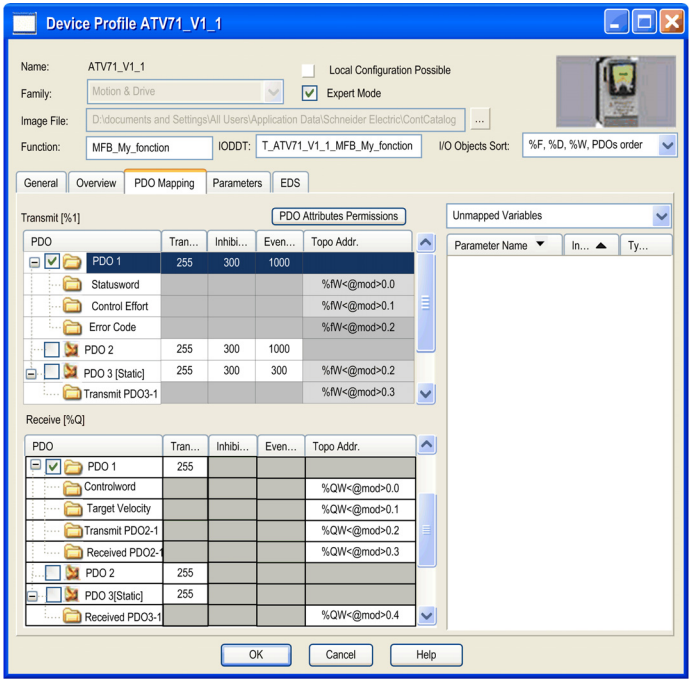


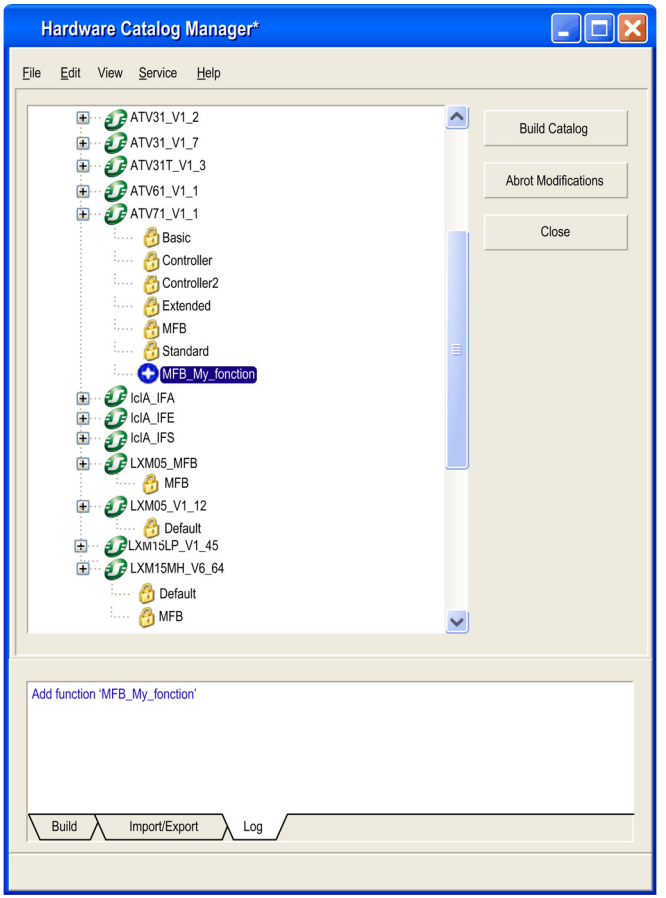
	Language Interface	Pdo Mapped	Index	I/O Data name	I/O object	Rank	IODOT Used	IODOT Field Name
1252	☐	☐	2070.04	Freq.const power			☐	Freq.Const power
1253	☐	☐	2071:02	Load sharing			☐	Load sharing
1254	☐	☐	2071:03	Load Correction			☐	Load correction
1255	☐	☐	2071:04	Correction min spd			☐	Correction min spd
1256	☐	☐	2071:05	Correction max spd			☐	Correction Max.spd
1257	☐	☐	2071:06	Torque offset			☐	Torque offset
1258	☐	☐	2071:07	Sharing filter			☐	Sharing folder
1259	☑	☐	603F:00	Error code	%W	6	☑	Error code
1260	☑	☑	6040:00	Control word	%QW	0	☑	Control word
1261	☑	☑	6040:01	Status word	%W	0	☐	
1262	☑	☑	6042:00	Target velocity	%QW	1	☑	Target velocity
1263	☐	☐	6043:00	Velocity demand			☐	Velocity demand
1264	☐	☑	6044:00	Control effort	%W	1	☐	
1265	☐	☐	6046:01	Velocity min amount			☐	
1266	☐	☐	6046:02	Velociy max amount			☐	
1267	☐	☐	6048:01	Delta speed			☐	
1268	☐	☐	6048:02	Delta time			☐	
1269	☐	☐	6049:01	Delta speed			☐	
1270	☐	☐	6049:02	Delta time			☐	

PDO Mapping

To map your PDOs, click on the PDO Mapping tab and do the following guideline:

Step	Action
1	To see your new selected objects in the Parameter Name Window, select Unmapped Variables in the List which is above the Parameter Name Window. 
2	Drag and drop your %IW objects from the Parameter Name Window to Transmit WIndow. **NOTE:** Drop your selected objects in the activated PDOs, i.e after the already mapped objects in the PDOs. 4 words are authorized by PDO. **NOTE:** If a few PDOs are already activated, you must choose the last activated PDO to insert your objects. **NOTE:** The topological addresses of the MFB Objects must be kept.

Step	Action
3	Do the step 2 for your %QW objects, from Parameter Name Window to Receive Window. 
4	Validate your configuration by clicking on OK

Step	Action
5	Your function and its mapping are created. 

⚠ WARNING

UNINTENDED EQUIPMENT OPERATION

Do not remove or change the original MFB Objects addresses.

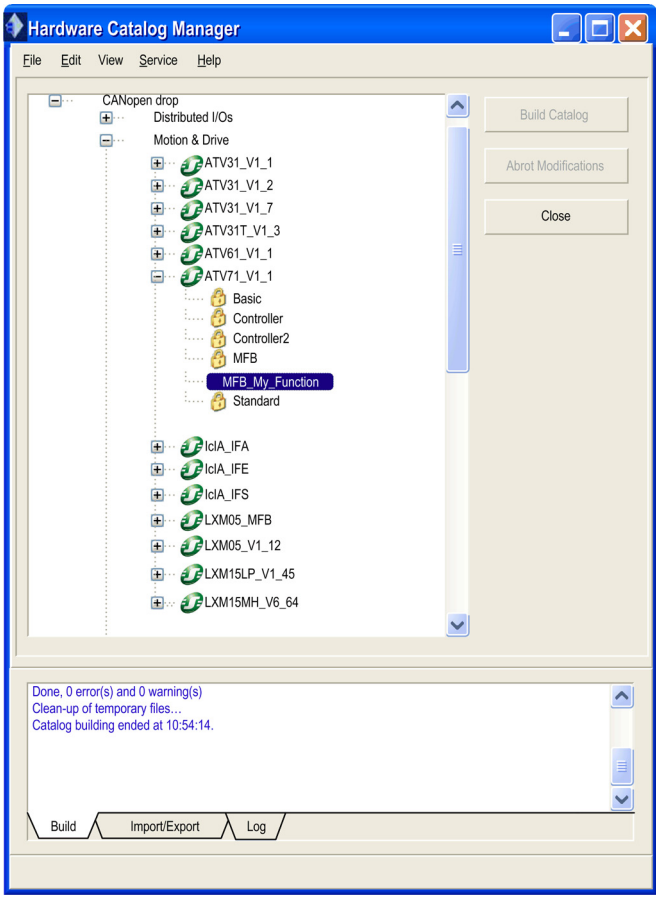
You must keep the same topological addresses, e.g Status Word %IW<@mod>0.5.

Failure to follow these instructions can result in death, serious injury, or equipment damage.

Build The Catalog

To integrate this new function in the Unity's Catalog, click on the Build Catalog Button. Therefore, the new function appears in the Hardware Catalog Manager.

NOTE: The creation of new MFB_xxx function is not available for the ICLA



CANopen Compatibility Restrictions

Compatibility Table

In a CANopen compatibility point of view, the CPU 2010/2030 are identical. Please note that there is no ascendant compatibility between an application developed with a CPU 2010/2030 and 20102/20302/20302H *(see page 15)*. Before launching your application, please refer to the following table in order to check its compatibility with your configuration:

Developed application with	**Restrictions**
Unity Pro V3.0 or Unity Pro V4.0 with a CPU 2010/ 2030.	Download on CPU 20102/20302/20302H *(see page 15)*: not compatible without doing **replace CPU** command.
Unity Pro V4.1 or later with a CPU 2010/ 2030.	Open with Unity Pro V3.0: compatible with import of the XEF file. Download on CPU 20102/20302/20302H *(see page 15)*: not compatible without doing **replace CPU** command.
Unity Pro V4.1 or later with a CPU 20102/ 20302/20302H *(see page 15)*. Note: CANopen expert functions are only viable with these CPU.	Open with Unity Pro V3.0: not compatible. Download on CPU 2010/2030: not compatible without doing **replace CPU** command, but Expert Functions (Boot Up Procedure and Object Dictionary) will be no longer available.

How to copy or delete a function

At a glance

Functions can be copied from one device to another, or deleted from the Catalog Manager database.

Copy

The Copy function is only available if a "Function" item on a device is selected in the Catalog Manager main screen.

Follow the instructions below to copy a function:
- Select Edit->Copy
- Right-click on the function name and select 'Copy'.

The function parameters are stored in the clipboard and can then be pasted to a compatible device.

Paste

The Paste function is only available if a "Function" is in the Clipboard and if a device is selected in the Catalog Manager main screen.

Follow the instructions below to paste a function:
- Select Edit->Paste
- Right-click on the device and select 'Paste'.

There is no need to specify the EDS file once more. The complete EDS file is already stored with the device.

The "Device Function" screen appears after pasting a function.The new function is initialized with the data of the source function. The same name is proposed for the new function and must be modified by the user before saving.

All other information can be modified and saved for the new function.

Delete

Functions can be deleted by the user:

Follow the instructions below to delete a function:
- Select a function from one device.
- Right-click on the function name and select 'Delete'.
  OR
  Select Edit->Delete
- A message will appear to request confirmation, click OK to continue.
- To save changes, click on the button 'Build Catalog'.

How to import/export or delete one or several user devices

At a glance

This section describes how to import, export or delete one or several user devices in the Catalog Manager.

Export User Devices

'Export User Devices' is enabled only:

- If nothing has been modified or if all modifications are already built in the catalog database.
- If at least one user device exists in the catalog.

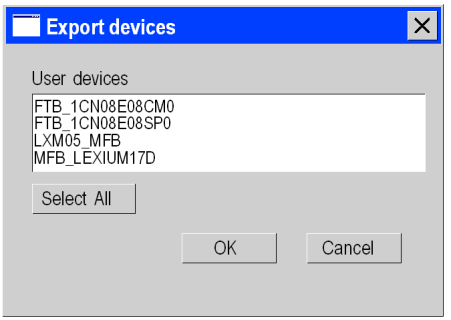
This is independent of the current item selection in the tree control.

The user must follow the instructions below to export user devices:

Select File->Export User Devices

A screen displays the list of devices with user function (user device and preprogrammed device with user function). Listbox supports multi-selection. Devices to export are selected in usual Windows-manner by Ctrl-Click or Shift-click. Alternatively all devices can be selected by clicking the "Select All" button.

The following illustration shows the 'export devices' screen:



On validation of this dialog and if one or more devices are selected, a standard windows "Save" dialog is shown allowing the user to choose file name and location of the export file.

The extension of the file name is .cpx.

The export file is a zip file composed of all catalog source files of the exported devices.

The user cannot export only one function; he must export all user functions from a device.

On validation of this dialog the *.cpx catalog source file is extracted from the database and saved.

Import User Devices

'Import User Devices' is enabled only:

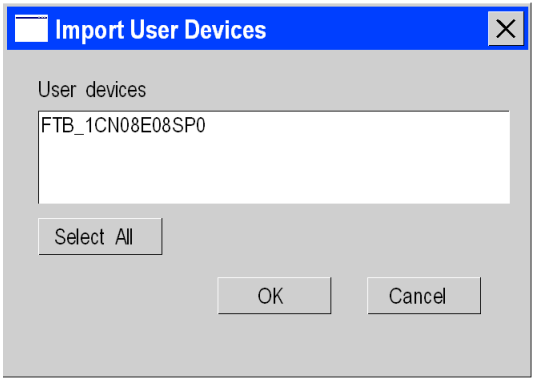
- If nothing has been modified or if all modifications are already built in the catalog database.
- It is independent of the current item selection in the tree control.

The user must follow the instructions below to import user devices:

Select File->Import User Devices

A standard Windows « Open » screen appears. Only *.cpx files are accepted.

On opening the cpx file the following modal dialog is displayed allowing the user to choose a subset of devices in cpx files:



This dialog works in the same way as for "Export User Devices" (multi-selection listbox).

On validation all necessary catalog source files are extracted from the *.cpx file and a new catalog database is built.

This new database contains:

- All Schneider core devices present in the old database.
- All User devices present in the old database.
- All User devices selected to Import in this dialog.

All user functions must be imported from a device, it is not possible to import only one function.

In case of conflicts, (a device or a function already present in the database with the same name but without the same ID) the device will not be imported and a message box will appear.

The outputsheet is used for messages that don't need to be acknowledged.

Please see chapter "Troubleshooting" for more details on possible conflicts and how they are handled.

At the end of the Import function, the main window is refreshed from the new database.

Delete User Devices

User devices can be deleted by the user.

The user must follow the instructions below to delete user devices:

- Select a user device from one device family.
- Delete it by a right-click.
- A message box will appear for confirmation, then click OK.
- To save any changes, click on the button ‘Build Catalog’.

How to close the Catalog Manager

At a glance

This is the procedure to close the Catalog Manager.

Procedure

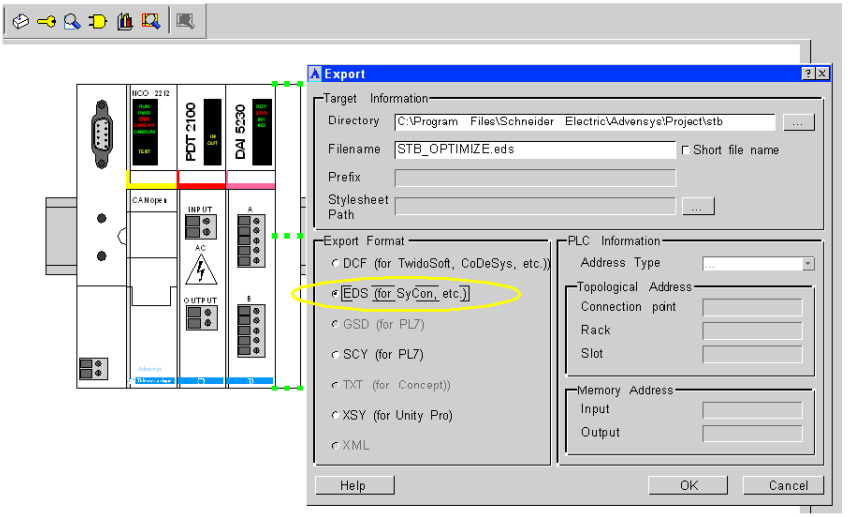
The table belows shows the procedure to close the Catalog Manager:

Step	Action
1	Verify that your changes have been saved: ● If there is changes, click on ‘ Build Catalog’. A window appears showing the progress of the catalog build. When the build is complete, go to the next step ● If there are not any changes, go to the next step.
2	Select File->Exit OR Select "Close" on the main windows.

Example of how to create a dedicated and optimized STB Island

At a glance

The following procedure describes how to create a dedicated and optimized STB Island

Step	Action
1	Launch Advantys software.
2	Create your optimized STB Island with the configuration that you want.
3	Export the EDS file. The following illustration describes the ‘Export EDS file‘ step: 
4	Open the Catalog Manager software.
5	Add a device to the Catalog Manager. How to add a device to the Catalog Manager *(see page 110)*.

5.3 Catalog Manager Troubleshooting

Subject of this section

This section presents the troubleshooting of the Catalog Manager.

What Is in This Section?

This section contains the following topics:

Topic	Page
Troubleshooting	145
SDO Abort Code Description	149
EDS/DCF Import Anomaly Code	150

Troubleshooting

At a glance

Use this section to find solutions to any difficulties that may be encountered when using the Catalog Manager.

Messages that need to be acknowledged by the user are shown in message boxes. All other messages are shown in the Output windows using a text color corresponding to the type of message:

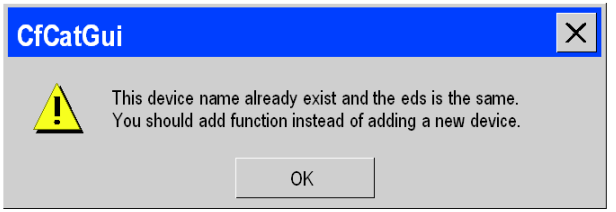
- Red for detected errors during analysis
- Orange for important information that must be checked
- Blue for information messages

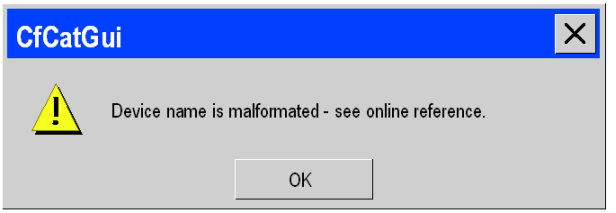
Troubleshooting

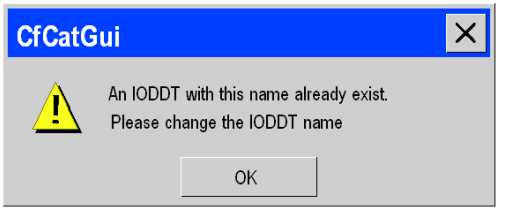
The following table describes the troubleshooting for the Catalog Manager:

Anomaly	Solution
Only available in read only mode	If Unity Pro is open, then the Catalog Manager will be opened in read mode. Therefore, all the functions which modify the Catalog Manager will be disabled. A message prompts to inform the user about the behaviour: Follow these intructions to solve this issue: • Close Unity Pro before opening the Catalog Manager. Unity Pro and the Catalog Manager can not be launched at the same time.

Anomaly	Solution

The device name already exist	The EDS file is required when the user wants to add or to import a device on the Catalog Manager database.
	● If a device name already exists in the Catalog.Then the user is asked if he wants to add a new function to the device.
	  ● If yes, then the existing device becomes selected in the main screen and the 'Add Function' service is called automatically.
	  ● If no, then the 'Add Device' service is refused.
	Follow these intructions to solve the anomalies:
	● Rename the device.
	● If the EDS file is refused then the reason is shown in a message and the 'Open' screen remains open. The user can select another EDS file or cancel the action.
	A message prompts to inform the user about the behaviour:
	 

The device name is malformated	The name doesn't have the right format: ● The number of characters is greater than 24. ● The name does not comply with the rules of naming the Unity Pro variables . Characters must be within the ranges A-Z, a-z or 0-9 and underline. Please note that the Hardware Catalog Manager creates a device name by default, by taking the EDS name and replacing prohibited characters by authorized ones. If you modify the device name with prohibited characters, the message appears. Follow these instructions to solve the anomalies: ● Reduce the number of characters and use the authorized characters as above. A message prompts to inform the user about the behaviour: 
The file is not supported. Do you want a default image?	The file is not found or the format is not supported.Only the .bmp and .jpg format are supported.

Anomaly	Solution
XML file format is not correct	The following messages can appears on the output windows: ● The syntax of the xml files is not correct. ● Incoherent xml. ● Wrong generation of the database. Follow these intructions to solve the anomaly: ● How to add a device to the Catalog Manager *(see page 110)*. ● How to add a function on a device *(see page 113)*.
An IODDT with this name already exist	The following messages can appears on the output windows. Follow these instructions to solve the anomalis: ● "The function name already exists". The function name must be renamed to solve it. ● "The IODDT name already exists". The IODDT must be rename to solve it. The following message appears: 
Wrong File Format	The following message can appears on the 'Export User Devices" action: ● Wrong file format. Follow these intructions to resolve this situation: ● How to import/export or delete one or several user devices *(see page 139)*.
Delete Device- Applications using the deleted device are no longer usable	This function is enabled only if the list of selected items in the tree control contains only "User Device" item.When all conditions for the "Delete Device(s)" function are fulfilled:- Main menu item "Edit / Delete" or- Context menu "Delete" on a selection of one or more User devices.The user is asked for confirmation of this action. The confirmation message informs about possible consequences: Applications using the deleted device are no longer usable. They cannot be opened. The following message appears: Follow these intructions to resolve this situation: ● How to import/export or delete one or several user devices *(see page 139)*.

Anomaly	Solution
Delete Function- Applications using the deleted device are no longer usable	This function is enabled only if the list of selected items in the tree control contains only "User Function" item. The default function of a device cannot be deleted.When all conditions for the "Delete Function(s)" service are fulfilled:- Main menu item "Edit / Delete" or- Context menu "Delete" on a selection of one or more User functions.The user is asked for confirmation of this action. The confirmation message informs about possible consequences: Applications using the deleted function are no longer usable. They cannot be opened. The folllowing message appears: Follow these intructions to resolve this situation: ● How to copy or delete a function *(see page 138)*.

SDO Abort Code Description

Table

The following table describes the Abort Code Description:

0503 0000h	Toggle bit not alternated.
0504 0000h	SDO protocol *(see page 159)*timed out.
0504 0001h	Client/ Server command specifier not valid or unknown.
0504 0002h	Invalid block size (block mode only).
0504 0003h	Invalid sequence number (block mode only).
0504 0004h	CRC error (block mode only).
0504 0005h	Out of memory.
0601 0000h	Unsupported access to an object.
0601 0001h	Attempt to read a write only object.
0601 0002h	Attempt to write a read only object
0602 0000h	Object does not exist in the object dictionary.
0604 0041h	Object cannot be mapped to the PDO.
0604 0042h	The number and length of the objects to be mapped would exceed PDO length.
0604 0043h	General parameter incompatibility reason.
0604 0047h	General internal incompatibility in the device.
0606 0000h	Access failed due to an hardware anomaly.
0607 0010h	Data type does not match, length of service parameter does not match.
0607 0012h	Data type does not match, length of service parameter too high.
0607 0013h	Data type does not match, length of service parameter too low.
0609 0011h	Sub-index does not exist.
0609 0030h	Value range of parameter exceeded (only for write access).
0609 0031h	Value of parameter written too high.
0609 0032h	Value of parameter written too low.
0609 0036h	Maximum value is less than minimum value.
0800 0000h	General anomaly.
0800 0020h	Data cannot be transferred or stored to the application.
0800 0021h	Data cannot be transferred or stored to the application because of local control.
0800 0022h	Data cannot be transferred or stored to the application because of the present device state.
0800 0023h	Object dictionary dynamic generation is inoperative or no object dictionary is present (for example object dictionary is generated from file and generation becomes inoperative because of an file anomaly).

EDS/DCF Import Anomaly Code

Table

The following table describes the EDS/DCF Import Anomalies:

Anomaly Name	Check performed Anomaly condition	Context delivered	Severity
W_IMP_ALREADYEXISTS	EDS/DCF already present.. Delivering existing instance.	ecEmpty	Monition
F_IMP_COBDNOTFOUND	COBID Profile Database not found.	ecCiAprofile Profile number	Fatal Anomaly
E_IMP_MISSINGMAND	Mandatory object is missing.Mandatory objects are [1000],[1001].	ecObjectMain/Subindex	Anomaly
E_IMP_ILLDATATYPE	Illegal object datatype.	ecObjectMain/Subindex	Anomaly
E_IMP_MISSINGSYNCCYCLE	Object [1006] is mandatory for Sync Producer. Sync Producer is [1005] Bit 30 == 1.	ecEmpty	Anomaly
E_IMP_MISSINGSYNC	Object [1006] resp [1007] cannot exist without Object [1005].	ecEmpty	Anomaly
W_IMP_MISSINGPDOCOMM	PDO communication parameter (20h) missing. PDO ignored.	ecPDO PDO type (In/Out); PDO number	Monition
W_IMP_MISSINGPDOMAP	PDO mapping parameter (21h) missing. PDO ignored.	ecPDO PDO type (In/Out); PDO number	Monition
E_IMP_MISSINGPDOCOBID	PDO communication parameter (21h) element COBID missing.	ecPDO PDO type (In/Out); PDO number	Anomaly

E_IMP_COBID	COBID check for objects [1005],[1012], [1014] – COBID must be in range 1h..7FFh if 11bits CAN Identifiers are used; COBID must be in range1h..1FFFFFFF if 29bit CANIdentifiers are used.	ecCOBID COBID as number.	Anomaly
E_IMP_PDO_COBID	PDO communication parameter COBID check for objects [14xxsub1] and [18xxsub1] – COBID must be in range1h..7FFh if 11bits CAN Identifiers are used; COBID must be inrange 1h..1FFFFFFF if 29bitCAN Identifiers are used.	ecPDOCOBID PDO type (In/Out); PDO number; COBID as number.	Anomaly
E_IMP_PDO_TTYPENOSYNC	PDO communication parameter transmission type check for objects [14xxsub2] and [18xxsub2] – values 0..252 are allowed only if [1005] exists.	ecPDO PDO type (In/Out); PDO number	Anomaly
E_IMP_MAPP_NOENTRY	PDO mapping entry check for objects [16xx] and [1Axx] – Mapped object must exist (excluding NWVs).	ecPDOmapp PDO type (In/Out); PDO number; Mapping entry number.	Anomaly
E_IMP_MAPP_NOTMAPPABLE	PDO mapping entry check forobjects [16xx] and [1Axx] – Mapped object must be mappable (PDOMapping=1).	ecPDOmapp PDO type (In/Out); PDO number; Mapping entry index.	Anomaly
E_IMP_MAPP_INVALIDDATATYPE	PDO mapping entry check for objects [16xx] and [1Axx] – Mapped object not mappable due to datatype.	ecPDOmappPDO type (In/Out); PDO number; Mapping entry index.	Anomaly
E_IMP_MAPP_LENGTHDATATYPEM-ISMATCH	PDO mapping entry check for objects [16xx] and [1Axx] – PDO mapping entry bitlength must match datatype of object to map.	ecPDOmappPDO type(In/Out); PDO number;Mapping entryindex	Anomaly
E_IMP_MAPP_ACCESSTYPE	PDO mapping entry check for objects [16xx] and [1Axx] – Object to map access type notsuitable for PDO type (RPDO,TPDO).	ecPDOmappPDO type(In/Out); PDO number; Mapping entryindex	Anomaly
E_IMP_MAPP_PDOLENGTH	PDO mapping entry check for objects [16xx] and [1Axx] – PDO length exceeded.	ecPDOmappPDO type(In/Out); PDO number; Mapping entryindex	Anomaly

E_IMP_MAPP_GRANULARITY	PDO mapping entry check for objects [16xx] and [1Axx] – Minimum bitlength allowed is 8, Bitmapping not supported by manager.	ecPDOmappPDO type(In/Out); PDO number; Mapping entryindex	Anomaly
I_IMP_CORR_ADDMAP	Auto correction applied: Empty PDO Mapping entry added, corresponding section missing in the EDS/DCF.	ecObjectMain/Subindex	Info
I_IMP_CORR_OBSOLETECOMMPAR	Auto correction applied: Removed obsolete PDO communication parameter.	ecObjectMain/Subindex	Info
I_IMP_CORR_ILLCOMMPAR	Auto correction applied: Removed illegal PDO communication parameter from RPDO.	ecObjectMain/Subindex	Info
I_IMP_CORR_DEFVALUE	Auto correction applied: Object default value not set, presuming 0.	ecObjectMain/Subindex	Info
I_IMP_CORR_DEFVALUECOMMPAR	Auto correction applied: PDO transmission type default value not set, presuming 255.	ecPDOPDO type (In/Out); PDO number	Info
I_IMP_CORR_INVALIDATEPDO	Auto correction applied: Deactivated PDO outside Predefined Connection Set.	ecPDOPDO type(In/Out); PDO number	Info

Programming

6

Introduction

This section describes the programming of a CANopen architecture.

What Is in This Chapter?

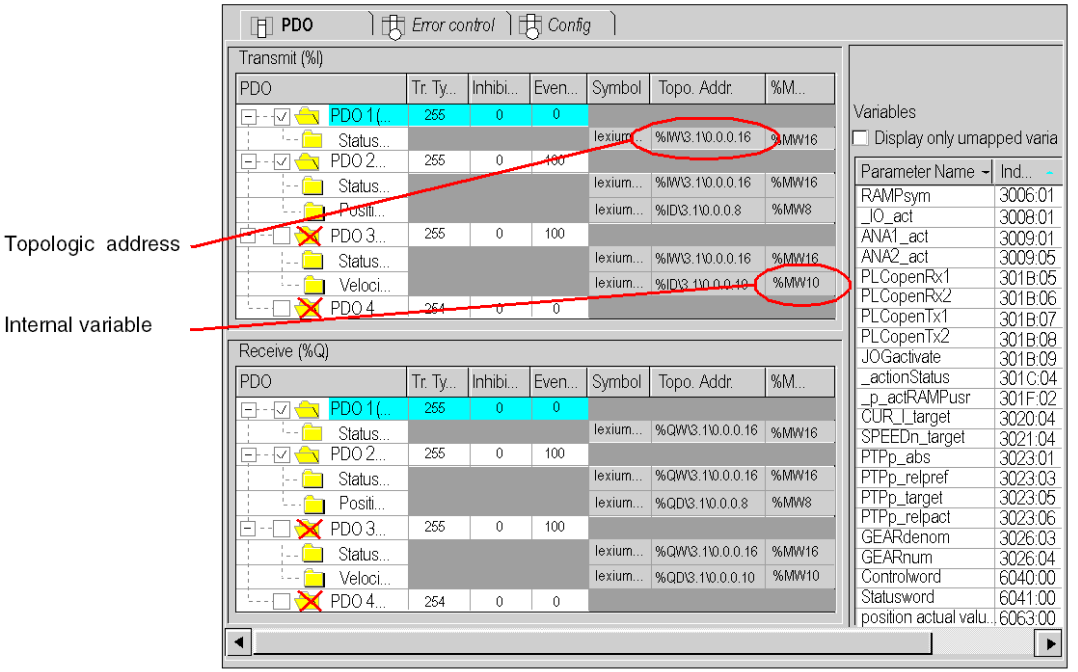
This chapter contains the following topics:

Topic	Page
Exchanges Using PDOs	154
Exchanges Using SDOs	159
Communication functions example	162
Modbus request example	168

Exchanges Using PDOs

At a Glance

PDOs use topologic addresses (`%I`, `%IW`, `%Q`, `%QW`) and internal variables (`%M` or `%MW`).

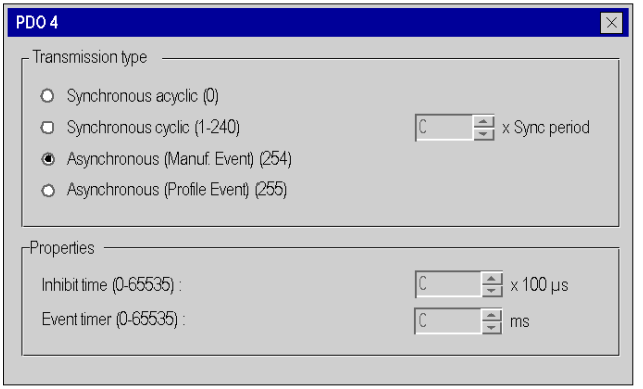


There is an equivalence between topologic addresses and internal variables. For example, in the figure above, the topologic address `%IW\3.1\0.0.0.16` is equivalent to `%MW16` for the PDO 1.

A PDO can be enabled or disabled.

According with the EDS file, some PDOs are already mapped.

A double click on the `transmission type` column displays the following window:



This window allows to configure:

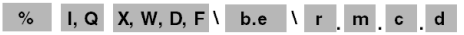
- the transmission type:
  - synchronous acyclic (0): a transmission type of 0 means that the message shall be transmitted synchronously with the SYNC message but not periodically according with the value.
  - synchronous cyclic (1-240): a value between 1 and 240 means that the PDO is transmitted synchronously and cyclically, the transmission type value indicating the number of SYNC messages between two PDO transmissions.
  - asynchronous (Manuf. Event)(254): the transmission type 254: the PDO is transmitted asynchronous. It is fully depending on the implementation in the device. Mainly used for digital I/O.
  - asynchronous (Profile Event)(255): the transmission type 255: the PDO is transmitted asynchronous when the value changes.

  Verify that the configured transmission type is supported by the selected device.
- the inhibit time: to mask the communication during this time,
- the event timer: time to manage an event in order to start a PDO.

NOTE: PDOs can only be configured using Unity Pro.

Structure of Topologic Address

The topologic address of input/output objects of a CANopen bus slave is structured in the following way:



Family	Element	Values	Meaning
Symbol	%	-	Indicates an IEC object.
Object type	I	-	Input object.
	Q	-	Output object.
Format (size)	X	8 bits (Ebool)	Ebool type Boolean (not compulsory).
	W	16 bits	16 bit WORD-type word.
	D	32 Bit	32 bit DINT-type word.
	F	32 Bit	32 bit REAL-type word.
Module/channel address and connection point	b	3 to 999	Bus number.
	e	1 to 63	Connection point number (CANopen slave number).
Rack number	r	0	Virtual rack number, always 0.
Module number	m	0	Virtual module number, always 0.
Channel number	c	Equal to 0 for all devices except the FTBs (channels numbered 0 to 7, then from 10 to 17).	Channel number.
Rank of data in the channel	d	0...999	Data number of slave. This number can vary from 0 to 999 because a slave can only have a maximum of 1000 input and output words.

Example of Topologic Addressing

Example of topologic addressing of an item connected to point 4 of the CANopen bus number 3:

Module digital/TOR autonomous with Boolean vision	
%I\3.4\0.0.5	Boolean value is entered on channel 5 (rang 0 omitted).
Module digital standard	
%IW\3.4\0.0.0.2.5	Boolean value is entered on unique channel 0, rank 2, bit 5. The mapping is given when the DCF file is imported.
Digital module on an Advantys STB island	
%IW\3.4\0.0.3.2	Word 3, bit 2, data by Advantys Configuration Software.

Numbering starts at:
- 0 for channel,
- 0 for rank.

NOTE: Virtual objects (racks, modules) always have a rank number equal to 0.

Object addressing of CANopen digital input/output follows the same rules as object addressing of digital input/output on rack: words, double words and floating words are in the same block.

Example: device at connection point 4 of CANopen bus 3, on channel 0, with:

Type of data	Topologic address:
2 input words	%IW \3.4\0.0.0.0 or %IW \3.4\0.0.0.1
1 double input word	%ID \3.4\0.0.0.2
1 floating input	%IF \3.4\0.0.0.4
1 output word	%QW\3.4\0.0.0.6

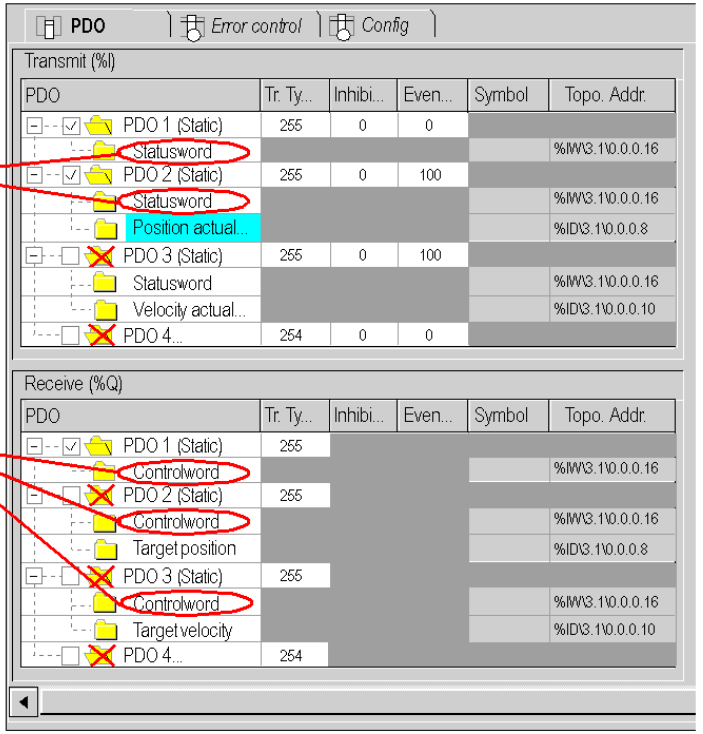
An object can be mapped in a PDO only once. If the same object is mapped several times in the same PDO, Unity Pro displays a message.

If there's several PDOs with the same mapped object, only one PDO can be enabled. If several PDOs with the same mapped object are enabled, Unity Pro displays a message when the application is rebuilt.

Example with a Lexium 05:

Detected error: the same object is mapped in two enabled PDOs

Only one PDO is enabled.



Exchanges Using SDOs

At a Glance

The explicit exchange of messages on a CANopen bus is done by read/write protocol.SDO.

There are 3 ways of accessing SDOs:

- using communication functions READ_VAR and WRITE_VAR,
- using the Unity Pro debugging screen,
- using the request ModBus FC43/0xD.

⚠ WARNING

UN INTENDED EQUIPMENT OPERATION

When modifying a variable, check the consequences of the SDO command in the documentation of the specific target CANopen device.

Failure to follow these instructions can result in death, serious injury, or equipment damage.

Communication Functions

It is possible to access SDOs using the communication functions READ_VAR and WRITE_VAR.

NOTE: It is possible to send up to 16 READ_VAR/WRITE_VARs simultaneously. A polling task runs every 5 ms and each task cycle in order to check the end of the exchange.This is useful if the user runs many SDOs during a task cycle.

For more information about the use of the communication function, see *Communication functions example, page 162*

NOTE: Changing outputs of a device with a write SDO has no effect on the %QW.

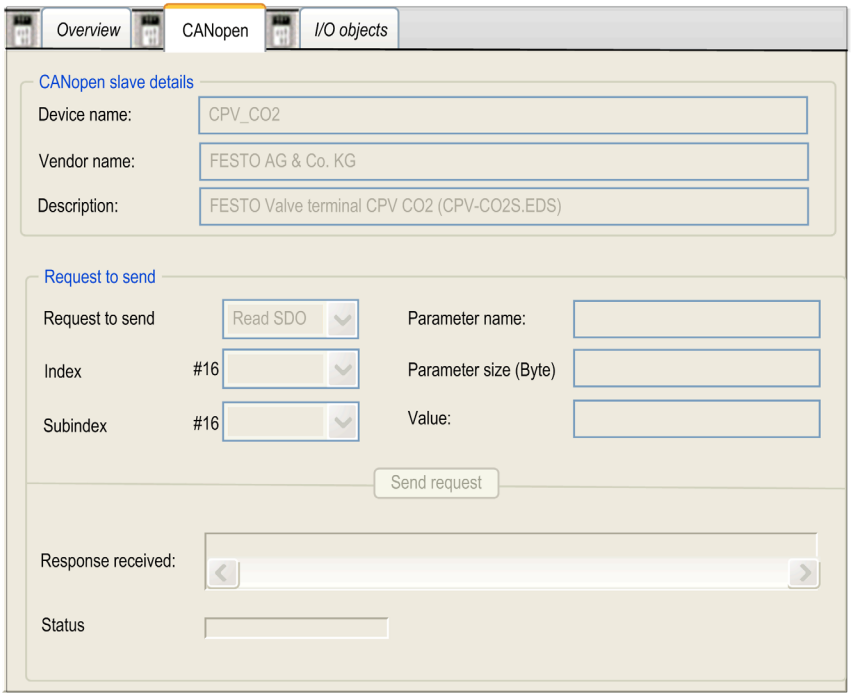
Unity Pro

SDO objects allow the access to the variables.

In online mode, the **CANopen** screen (see *Slave Diagnostics, page 183*) allows access to:

- various device objects in read/write mode (only through a listbox),
- description of the variables,
- repeat of communication.
- the supported IODDT (only T_COM_CO_BMX and T_COM_CO_BMX_ EXPERT).

The **CANopen** screen is brought up as follows:

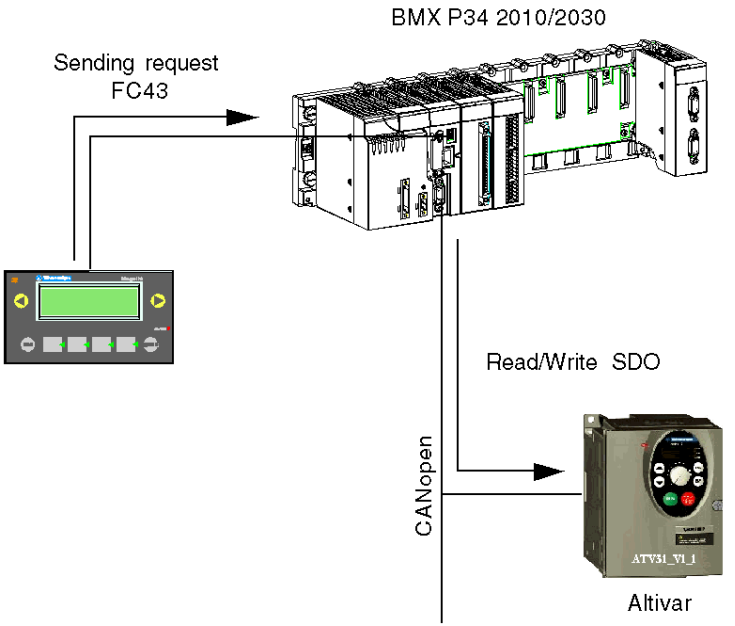


SDO information (read or written) are displayed in their native format (Byte, Word and DWord). You can change the display format to Binary, Decimal and Hexadecimal with popup menu.

The Status Box can display OK or an abort code *(see page 149)*.

Modbus Request

From a Human/Machine interface (example: XBT), it is possible to access the SDOs using the Modbus FC43 request



For more information about the use of the Modbus request FC43/0xD, see *Modbus request example, page 168*

SDO Timeouts

Various time-outs are implemented. They depend on the type of object as well as the type of access (read/write):

Object	Timeout
1010h	15 s
1011h	3 s
2000h to 6000h	8 s
All other objects - SDO Reading - SDO Writing	 1 s 2 s

Communication functions example

At a Glance

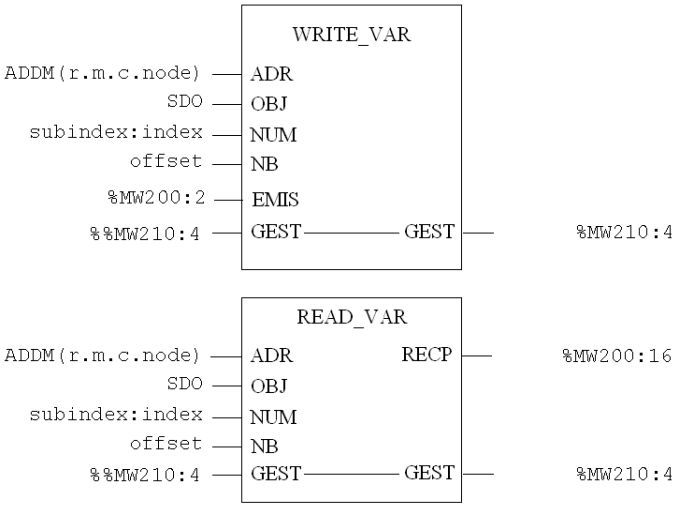
It is possible to access SDOs using the communication functions READ_VAR and WRITE_VAR

There are 3 possible representations:

- the FBD representation,
- the Ladder representation,
- the IL representation.

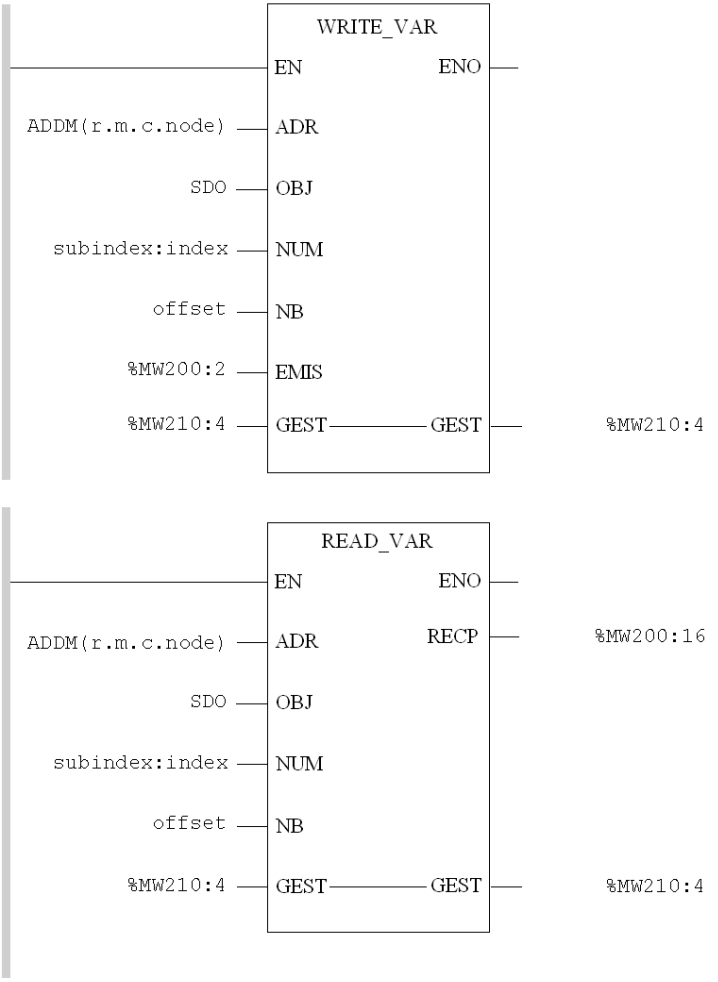
FBD representation

The FBD representations of the communication functions are the following:



Ladder representation

The Ladder representations of the communication functions are the following:



IL representation

The communication function syntax is as follows:

```
ADDM(
 IN :=’ 0.0.2.2’
)
ST %MW2100:8
LD 50
ST %MW2182 (* timeout 5 secondes *)
LD 2
ST %MW2183 (* Length *)
(* Read the "Vendor ID" object, slave @2, CANopen Network *)
READ_VAR (
 ADR := %MW2100:8,
 OBJ := ‘SDO’,
 NUM := 16#00011018,
 NB := 0,
 GEST := %MW2120:4,
 RECP := %MW2110:4
)
(* Write the value 16#FFFF, slave @2 ouputs, CANopen Network *)
LD 16#ffff
ST %MW2200
WRITE_VAR (
 ADR := %MW2100:8
 OBJ := ‘SDO’,
 NUM := 16#00016300,
 NB := 0,
 EMIS := %MW2200:1,
 GEST := %MW2180:4
)
```

NOTE: The `offset` parameter must be set to 0.

NOTE: The `subindex : index` parameter is encoded in a simple word (`subindex` is the higher byte).

Parameter Description of the WRITE_VAR Function

The following table outlines the various parameters of the WRITE_VAR function:

Parameter	Description
ADDM('r.m.c.node')	Address of the destination entity of the exchange: ● **r**: the processor rack number, ● **m**: processor slot in the rack (0) ● **c**: channel (only use the channel 2 for CANopen), ● **node**: identifier of the transmitting device on the CANopen bus.
'SDO'	SDO object type.
subindex:index	Double word or immediate value identifying the CANopen SDO index or subindex: The most significant word making up the double word contains the sub-index and the least significant word contains the index. **Example**: if you use the double word subindex:index: ● the 16 most significant bits contain the subindex, ● the 16 least significant bits contain the index.
EMIS	Table of words containing the SDO datum to send (%MW200:2). The recept buffer of the WRITE_VAR function must be greater than the SDO. The length of a SDO is indicated in device documentation.
GEST	Table of words with 4 inputs (%MW210:4).

Parameter Description of the READ_VAR Function

The following table outlines the various parameters for the READ_VAR function:

Parameter	Description
ADDM('r.m.c.node')	Address of the destination entity of the exchange: ● **r**: the processor rack number, ● **m**: processor slot in the rack (0) ● **c**: channel (only use the channel 2 for CANopen), ● **node**: identifier of the destination device on the bus.
'SDO'	SDO object type.
subindex:index	Double word or immediate value identifying the CANopen SDO index or subindex: The most significant word making up the double word contains the sub-index and the least significant word contains the index. **Example**: if you use the double word subindex:index: ● the 16 most significant bits contain the subindex, ● the 16 least significant bits contain the index.
GEST	Table of words with 4 inputs (%MW210:4).
RECP	Table of words with at least one input to receive the SDO datum received (%MW200:16). The recept buffer of the READ_VAR function must be greater than the SDO. The length of a SDO is indicated in device documentation.

Description of control block words

The following table describes the various words of the control block:

Fields	Word	Type	Description
Control byte	0 (least significant)	BYTE	Bit 0 = activity bit Bit 1 = cancellation bit
Exchange ID	0 (most significant)	BYTE	Single number, identifier of the exchange.
ComState	1 (least significant)	BYTE	0x00 = Exchange completed 0x01 = Time Out 0x02 = User cancelled 0x03 = Incorrect address format 0x04 = Incorrect destination address 0x06 = Incorrect Com Fb parameters 0x07 = Generic transmission interruption 0x09 = Buffer received too small 0x0B = No system resources 0xFF = Network exchange detected error
ExchState	1 (most significant)	BYTE	If ComState = 0x00 : 0x00: request treated 0x01: Cannot be treated 0x02: Incorrect response If ComState = 0xFF 0x07: Generic exchange detected error 0x0B: The destination device has no more resources. 0x0D: The device cannot be reached. 0x2B: SDO exchange detected error
Timeout	2	WORD	Timeout value (x 100 ms)
Length	3	WORD	Length in bytes

Example in ST language

```
(* read the node 5 SDO, index 1018, subindex 3 *)
if (%M400) then
 subindex_index := 16#00031018 ;
 %MW1052 := 50; (* timeout 5 secondes *)

READ_VAR(ADDM('0.0.2.5'),'SDO',subindex_index,0,%MW1050:4,%M
W1100:2);
 %M400:= 0;
end_if;
(* Write the node 31 SDO, index 203C, subindex 2 *)
if (%M401) then
 subindex_index := 16#0002203C;
 %MW1152 := 50; (* timeout 5 secondes *)
 %MW1153 := 2; (* length 2 bytes *)
 %MW1200 := 16#03E8; (* value of object *)
 WRITE_VAR(ADDM('0.0.2.31'),'SDO',subindex_index,0,
%MW1200:1,%MW1150:4);
 %M401:= 0;
end_if;
```

Modbus request example

At a Glance

From a Man Machine Interface (example : XBT), it is possible to access the SDOs using the Modbus FC43 request

SDO read example

Node reading 1F, object 1005, subindex 00, length 8 bytes

FC	MEI	Prot	Nid	Index	Sub	Offset	Length
2B	0D	00	1F	10 05	00	00 00	00 08

Response OK: reception of 4 bytes

FC	MEI	Prot	Nid	Index	Sub	Offset	Length	Object value
2B	0D	00	1F	10 05	00	00 00	00 04	80 00 00 00

Failure: SDO cancellation code

FC	MEC	Ext length	MEI	Excpt code	SDO abort code
AB	FF	00 06	0D	EC	06 02 00 00

Write SDO example

Node reading 1F, object 203C, subindex 02, length 2 bytes 03 E8

FC	MEI	Prot	Nid	Index	Sub	Offset	Length	Data
2B	0D	01	1F	20 C3	02	00 00	00 02	03 E8

Response OK: reception of 4 bytes

FC	MEI	Prot	Nid	Index	Sub	Offset	Length
2B	0D	00	1F	20 3C	02	00 00	00 00

Failure: SDO cancellation code

FC	MEC	Ext length	MEI	Excpt code	SDO abort code
AB	FF	00 06	0D	EC	06 02 00 00

Debugging Communication on the CANopen Bus

7

Aim of this Chapter

This chapter presents the debugging of the CANopen bus master and slaves.

What Is in This Chapter?

This chapter contains the following topics:

Topic	Page
How to Access the Debug Screens of Remote Devices	170
Debugging Screen of the CANopen Master for CPUs 2010/ 2030	171
Debugging Screen of the CANopen Master for CPUs 20102/ 20302	173
Slave Debug Screens	175

How to Access the Debug Screens of Remote Devices

At a Glance

The following operations describe how to access different debug screens of the CANopen network elements.

NOTE: The debug screenscan only be accessed in online mode.

Master Debug Screen

To access the master debug screen, perform the following actions:

Step	Action
1	Connect to the manager PLC.
2	Access the CANopen master configuration screen *(see page 86)*.
3	Select the **Debug** tab.

Slave Debug Screen

To access the slave debug screen, perform the following actions:

Step	Action
1	Connect to the manager PLC.
2	Access the CANopen slave configuration screen *(see page 66)*.
3	Select the **Debug** tab.

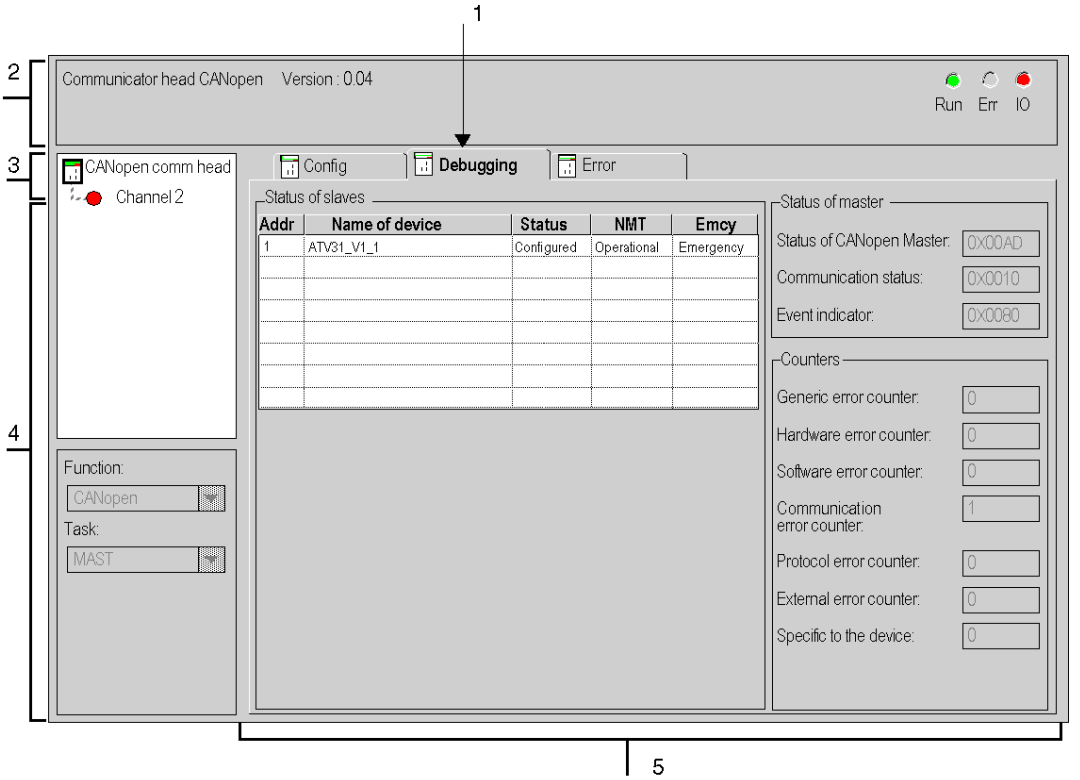
Debugging Screen of the CANopen Master for CPUs 2010/ 2030

At a Glance

This screen can only be used in online mode.

Illustration

The figure below shows a master debug screen:



Elements and Functions

The table below describes the different areas which make up the master debug screen:

Read	Number	Channel
1	Tab	The tab in the foreground indicates the type of screen displayed. In this case, the debug screen.
2	Module	This area is made up of the abbreviated heading of the module equipped with a CANopen port, as well as 3 LEDs indicating the status of the module.
3	Channel	This area allows you to select the communication channel to be debugged. By clicking on the device, you display the tabs: ● **Description** : gives the characteristics of the built-in CANopen port, ● **Inputs/outputs objects**: allows pre-symbolizing of the input/output objects, By clicking on the channel, you display the tabs: ● **Configuration** : enables you to declare and configure the CANopen master, ● **Debug**: accessible in online mode only. ● **Faults**: accessible in online mode only. This area also has an LED indicating the channel status.
4	General parameters	This area is used to view: ● the communication function, ● the task associated with the CANopen bus
5	Display and command	This area is composed of 3 windows which let you know: ● the CANopen slaves status, ● the status of the CANopen master *(see page 149)*, ● the status of the detected error counters.

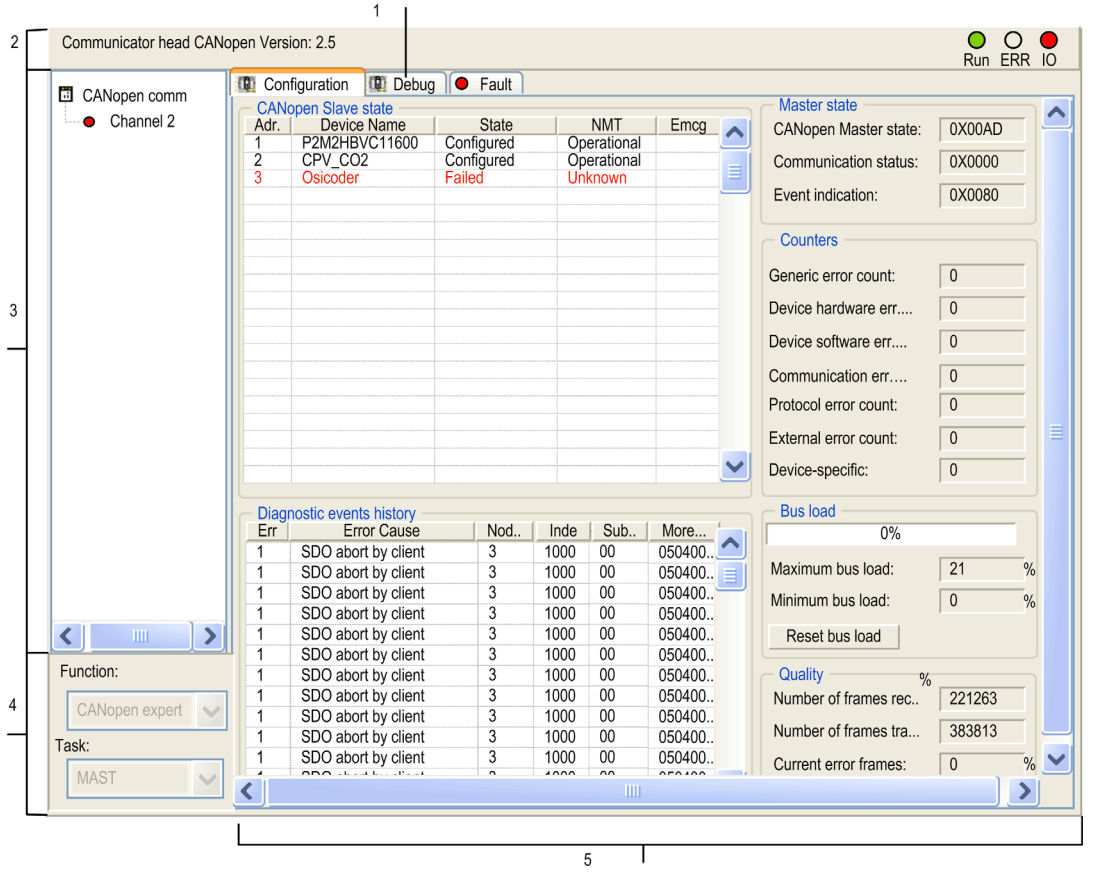
Debugging Screen of the CANopen Master for CPUs 20102/ 20302

At a Glance

This screen can only be used in online mode.

Illustration

The figure below shows a master debug screen:



Elements and Functions

The table below describes the different areas which make up the master debug screen:

Read	Number	Channel
1	Tab	The tab in the foreground indicates the type of screen displayed. In this case, the debug screen.
2	Module	This area is made up of the abbreviated heading of the module equipped with a CANopen port, as well as 3 LEDs indicating the status of the module.
3	Channel	This area allows you to select the communication channel to be debugged. By clicking on the device, you display the tabs: ● **Description** : gives the characteristics of the built-in CANopen port, ● **Inputs/outputs objects**: allows pre-symbolizing of the input/output objects, By clicking on the channel, you display the tabs: ● **Configuration** : enables you to declare and configure the CANopen master, ● **Debug**: accessible in online mode only. ● **Faults**: accessible in online mode only. This area also has an LED indicating the channel status.
4	General parameters	This area is used to view: ● the communication function, ● the task associated with the CANopen bus
5	Display and command	This area is composed of 3 windows which let you know: ● the CANopen slaves status, ● The status of the CANopen master. *(see page 197)* ● the status of the detected error counters. ● the status of bus load *(see page 182)*. ● the status of bus quality *(see page 182)*. ● the status of the diagnostics events table *(see page 181)*.

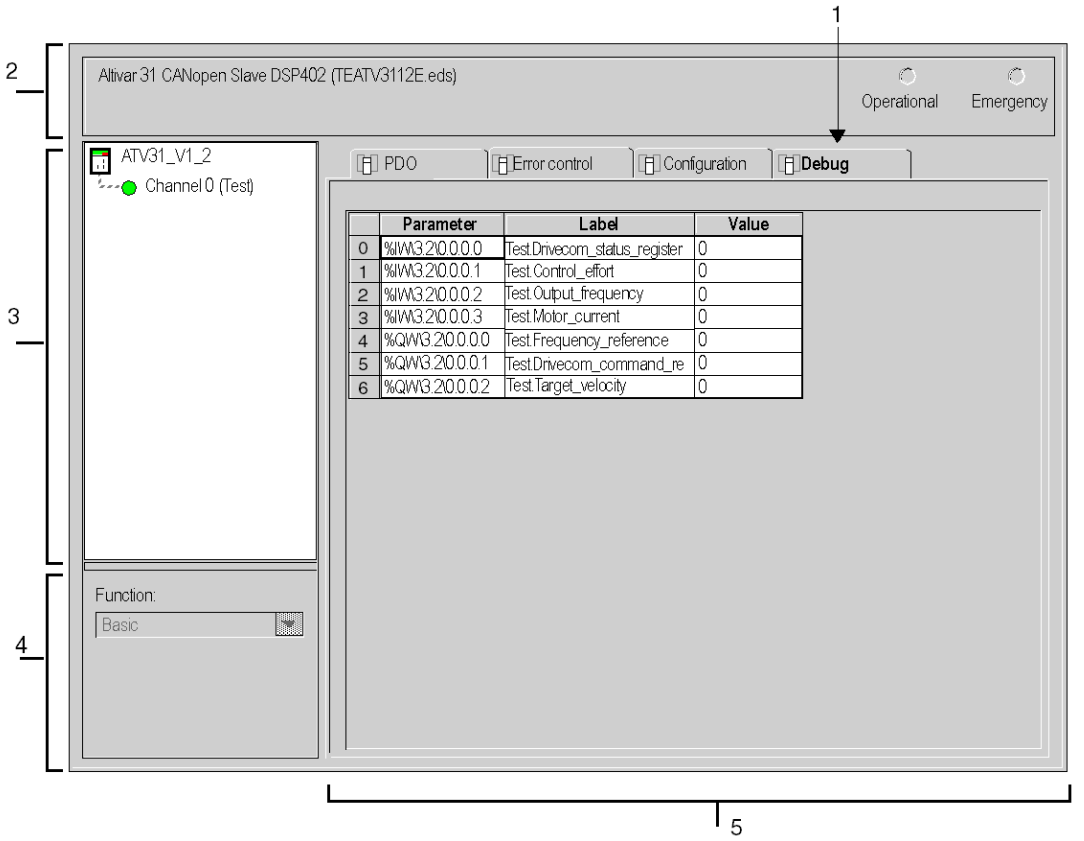
Slave Debug Screens

At a Glance

This screen can only be used in online mode.

Illustration

The figure below shows a slave debug screen:



Description of the Debug Screen for Standard Devices

The following table shows the various parts of the debugging screen and their functions:

Number	Element	Function
1	Tabs	The tab in the foreground indicates the type of screen displayed. In this case, the debug screen.
2	**Module** area	Contains the abbreviated title of the module. Two LEDs are found in the same area: • a green LED indicating that the device is operational (ON/OFF), • a red LED indicating an emergency (ON/OFF).
3	**Channel** area	This area allows you to select the communication channel to be debugged. By clicking on the device, you display the tabs: • **Description:** gives the characteristics of the built-in CANopen port. • **Inputs/outputs objects:** allows pre-symbolizing of the input/output objects. • **CANopen:** allows read/write of SDO. • **Defaults**: accessible in online mode only. By clicking on the channel, you display the tabs: • **PDO:** enables you to configure the PDOs. • **Configuration:** enables you to declare and configure the CANopen master. • **Debug:** accessible in online mode only. • **Error control:** accessible in online mode only. This area also has an LED indicating the channel status.
4	**General parameters** area	Recalls the function associated with the channel.
5	**Parameters in progress** area	This area displays the information of an inputs/outputs datum for all the channels. It is divided into 3 columns: • the **Parameter** column displays the inputs/outputs objects and the unmarked objects on which the inputs/outputs datum is mapped, • the **Label** column shows the name of the inputs/outputs datum, • the **Value** column shows the value of the inputs/outputs datum.

NOTE: For standard devices, the values are displayed in the following formats:

- decimal (default),
- hexadecimal,
- binary.

To select the format, right-click on a value in the debug screen, then choose the **display mode**.

For devices with boolean vision (FTB) the value can be forced.

NOTE: In the **Value** column, when a variable appears in red, it shows that it's out of range. The range of the variable can be seen by clicking on it. The range is displayed in the status bar.

Diagnostics

8

Aim of this Chapter

This section introduces the diagnostic means of the CANopen bus.

What Is in This Chapter?

This chapter contains the following topics:

Topic	Page
How to perform a diagnostic	178
Master Diagnostics for CPUs 2010/ 2030	179
Master Diagnostics for CPUs 20102/ 20302	180
Slave Diagnostics	183

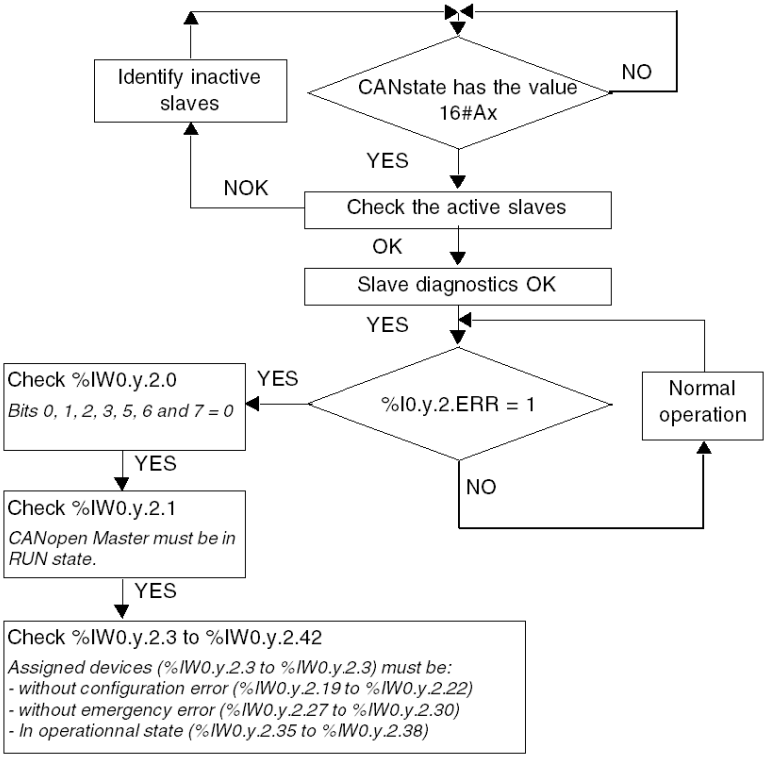
How to perform a diagnostic

At a Glance

You can start by using the LEDs located on the forward face of the processor to search for detected errors *(see page 197)* on the CANopen bus. Next, you can use the procedure (described below) which details bus start up management and the checks to be carried out using the language objects provided by the PLC.

Procedure

The following diagram indicates the different phases of the procedure:



How to check %IW0.y.2

For the various states of %IW, refer to the T_COM_CO_BMX IODDT *(see page 197)*.

Master Diagnostics for CPUs 2010/ 2030

At a Glance

The CANopen bus master can be diagnosed:

- at module level,
- at channel level.

Module Diagnostics

The Module diagnostics screen displays current errors classed according to their category:

- Internal,
- External,
- Other.

Channel Diagnostics

The Channel diagnostics screen displays current anomalies classed according to their category:

- External,
- Other.

The table below presents the possible anomalies of a CANopen function:

Error type	Error	Language object
External	The CANopen master is not operational.	%MWr.m.c.2.0
	One or several slaves are not operational.	%MWr.m.c.2.1
Other	Configuration detected error.	%MWr.m.c.2.3
	Overrun of the reception queue low priority.	%IWr.m.c.0.0
	CAN controller overrun.	%IWr.m.c.0.1
	CAN controller disconnected from the bus.	%IWr.m.c.0.2
	CAN controller detected error.	%IWr.m.c.0.3
	The CAN controller is no longer in error state.	%IWr.m.c.0.4
	Overrun of the transmission queue low priority.	%IWr.m.c.0.5
	Overrun of the reception queue high priority.	%IWr.m.c.0.6
	Overrun of the transmission queue high priority.	%IWr.m.c.0.7
	The task cycle time is greater than the CANopen master cycle time.	%IWr.m.c.0.8

Master Diagnostics for CPUs 20102/ 20302

At a Glance

The CANopen bus master can be diagnosed:

- at module level,
- at channel level.

Module Diagnostics

The Module diagnostics screen displays current errors classed according to their category:

- Internal,
- External,
- Other.

Channel Diagnostics

The Channel diagnostics screen displays current anomalies classed according to their category:

- External,
- Other.

The table below presents the possible anomalies of a CANopen function:

Error type	Error	Language object
External	The CANopen master is not operational.	%MWr.m.c.2.0
	One or several slaves are not operational.	%MWr.m.c.2.1
Other	Configuration detected error.	%MWr.m.c.2.3
	Overrun of the reception queue low priority.	%IWr.m.c.0.0
	CAN controller overrun.	%IWr.m.c.0.1
	CAN controller disconnected from the bus.	%IWr.m.c.0.2
	CAN controller detected error.	%IWr.m.c.0.3
	The CAN controller is no longer in error state.	%IWr.m.c.0.4
	Overrun of the transmission queue low priority.	%IWr.m.c.0.5
	Overrun of the reception queue high priority.	%IWr.m.c.0.6
	Overrun of the transmission queue high priority.	%IWr.m.c.0.7
	The task cycle time is greater than the CANopen master cycle time.	%IWr.m.c.0.8

Diagnostic Events History

The diagnostics events history is mainly used to analyze the boot up procedure of the CANopen bus. You can clear or refresh the diagnostic: right-click on the box, and select the clear or refresh command in the pop up menu.

The events are displayed on the following 6 columns table :

Error Code	Error Cause	Node ID	Index	Subindex	Additional Information MSB LSB
1	SDO abort by client	Slave Node ID	Index	Subindex	SDO abort code *(see page 149)*
2	SDO abort by server	Slave Node ID	Index	Subindex	SDO abort code
3	Identity mismatch	Slave Node ID	Index	Subindex	SDO response shows the read ID
4	Error control event	Slave Node ID	0	0	0, 0, 0, 0
5	Device in wrong state	Slave Node ID	0	0	0, 0, actual_state, exp_state
6	COMMstatus event	0	0	0	0, 0, 0, COMMstatus
7	A module usues the Node ID of the CANopen manager	Manager Node ID	0	0	0, 0, 0, 0
8	Unexpected present device	Slave Node ID	0	0	0, 0, 0, 0
9	Unexpected bootup message	Slave Node ID	0	0	0, 0, 0, 0
10	Received PDO with wrong length	0	0	0	COB-ID of RPDO
11	Manager is the only device on network	0	0	0	0, 0, 0, 0
from 12 to 127	Reserved				
from 128 to 255	Reserved for internal detected errors	Any debug information			

Bus Load

The bus load panel gives information about the load of the bus: current load in real time, maximum and minimum loads. The values can be reset by clicking on the button Reset Bus Load

The following table shows the language objects associated to this function:

Function	Request	Language Object
Bus Load	Read_IW	%IW0.0.2.63
		%IW0.0.2.62
		%IW0.0.2.64
	Write QW	%QW0.0.2.0.4

Bus Quality

The Bus Quality panel provides information from counters about the frames: received, transmitted, current with anomalies, maximum and minimum with anomalies in percent of the entire trafic. The values can be reset by clicking on the button Reset Counter.

The following table shows the language objects assoicated to this function:

Function	Request	Langauge Objects
Bus Quality	Read_IW	%ID0.0.2.66
		%ID0.0.2.68
		%IW0.0.2.70
		%IW0.0.2.71
		%IW0.0.2.72
	Write QW	%QW0.0.2.0.3

Slave Diagnostics

At a Glance

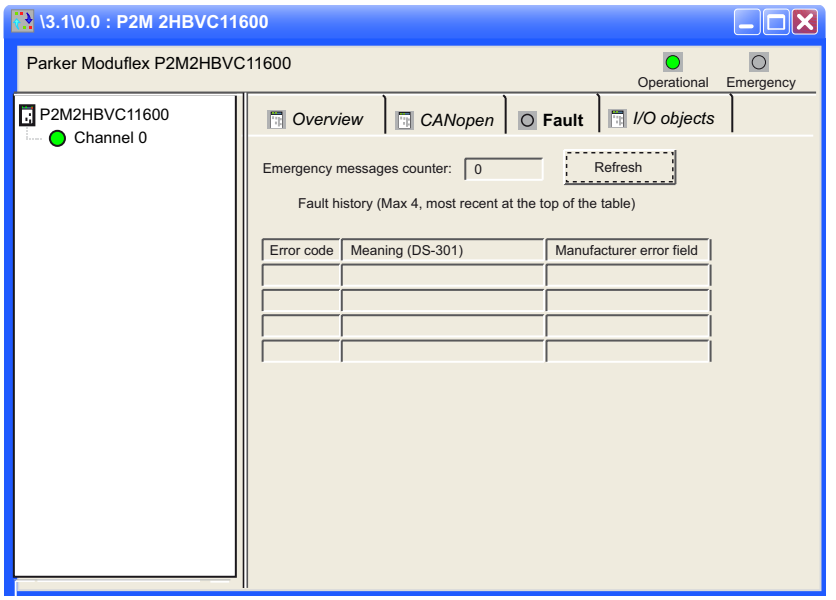
Slave diagnostics are only performed at the device level.

The slave diagnostic screen displays:

- the received emergency messages counter,
- The last four emergency messages *(see page 225)* received in chronological order.

Illustration

The figure below shows a slave diagnostic screen:



Elements and Functions

The table below describes the different areas which make up the master debug screen:

Read	Number	Channel
1	Tab	The tab in the foreground indicates the type of screen displayed. In this case, the diagnostic screen.
2	Module	This area is made up of the abbreviated heading of the module equipped with a CANopen port, as well as 2 LEDs indicating the status of the module.
3	Channel	This area allows you to select the communication channel to be debugged. By clicking on the device, you display the tabs: ● **Overview**: gives the characteristics of the device, ● **CANopen**: allows read/write of SDO *(see page 159)* (online mode only), ● **Faults**: allows you to see the last 4 emergency messages *(see page 225)* generated by the slave module (tab only accessible in online mode) (see manufacturer's documentation), ● **I/O Objects**: allows pre-symbolizing *(see page 248)*of the input/output objects. This area also has an LED indicating the channel status.
4	Display	This area is composed: ● of detected error counters, ● of the last 4 messages (the last received message is in the upper line).

NOTE: The error counter cannot be reset to 0.

NOTE: There is no polling on emergency messages. Messages are updated once after opening the screen only. The user can refresh them with the refresh button.

NOTE: The emergency messages counter is automatically refreshed. If some new messages appear, the back color of the refresh button becomes red to indicate that the user must refresh the list.

Language Objects

9

Aim of this Chapter

This chapter describes the implicit and explicit language objects associated with the CANopen master embedded in CPU modules.

NOTE: The system bits %S9 and system words %SW8 and %SW9 are not applicable on CANopen.

What Is in This Chapter?

This chapter contains the following sections:

Section	Topic	Page
9.1	General Information	186
9.2	Language Object of the CANopen Specific IODDT	196
9.3	Emergency objects	225

9.1 General Information

Subject of this Section

This section describes:
- The language objects and IODDT of CANopen communication.
- The language objects and generic IODDT applicable to communication protocol except Fipio and Ethernet.

What Is in This Section?

This section contains the following topics:

Topic	Page
Introduction to the Language Objects for CANopen Communication	187
Implicit Exchange Language Objects Associated with the Application-Specific Function	188
Details of IODDT Implicit Exchange Objects of Type T_COM_STS_GEN	189
Explicit Exchange Language Objects Associated with the Application-Specific Function	190
Details of IODDT Explicit Exchange Objects of Type T_COM_STS_GEN	192
Management of Exchanges and Reports with Explicit Objects	194

Introduction to the Language Objects for CANopen Communication

General

The IODDTs are predefined by the manufacturer and contain inputs/outputs language objects belonging to a channel of a specific application module.

CANopen communication has one associated IODDT:

- `T_COM_STS_GEN` used by communication protocols except Fipio and Ethernet,

NOTE: the creation of an IODDT-type variable is performed in two ways:

- **I/O object** tab,
- Data editor.

Language Object Types

Each IODDT contains a group of language objects which are used to control them and check their operation.

There are two types of language objects:

- implicit exchange objects automatically exchanged at each cycle of the task associated with the module,
- explicit exchange objects exchanged at the request of the application, using explicit exchange instructions.

Implicit exchanges concern the status of the modules, the communication signals, the slaves, etc.

Explicit exchanges allow module parametering and diagnostics.

NOTE: Each slave device has an IODDT (except FTB). For more information, please refer to the user manual of the concerned device.

Implicit Exchange Language Objects Associated with the Application-Specific Function

At a Glance

An integrated application-specific interface or the addition of a module automatically enhances the language objects application used to program this interface or module.

These objects correspond to the input/output images and software data of the module or integrated application-specific interface.

Reminders

The module inputs (%I and %IW) are updated in the PLC memory at the start of the task, the PLC being in RUN or STOP mode.

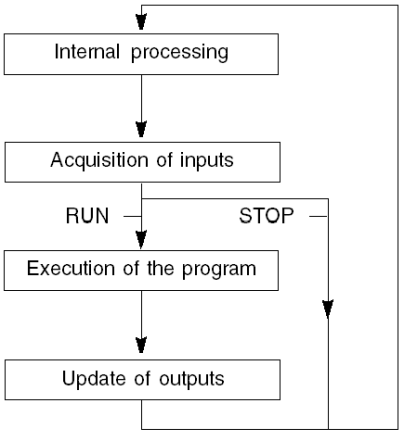
The outputs (%Q and %QW) are updated at the end of the task, only when the PLC is in RUN mode.

NOTE: For BMX P34 processors, when the task occurs in STOP mode, depending on the configuration selected:

- Outputs are set to fallback position (fallback mode),
- Outputs are maintained at their last value (maintain mode).

Figure

The following diagram shows the operating cycle of a PLC task (cyclical execution).



Details of IODDT Implicit Exchange Objects of Type T_COM_STS_GEN

Introduction

The following table presents the IODDT implicit exchange objects of type `T_COM_STS_GEN` applicable to all communication protocols except Fipio and Ethernet.

Error Bit

The table below presents the meaning of the detected error bit `CH_ERROR` (`%Ir.m.c.ERR`).

Standard Symbol	Type	Access	Meaning	Address
CH_ERROR	EBOOL	R	Communication channel error bit.	%Ir.m.c.ERR

Explicit Exchange Language Objects Associated with the Application-Specific Function

At a Glance

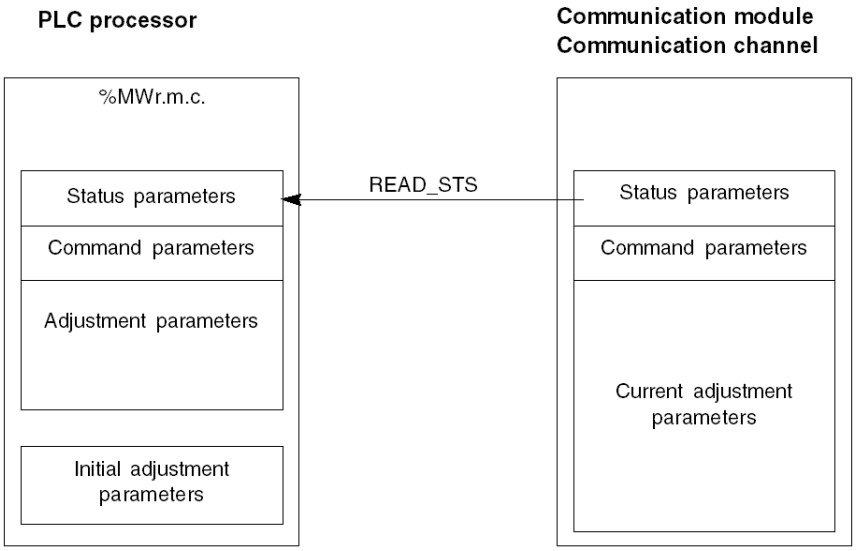
Explicit exchanges are exchanges performed at the user program's request, and using the `READ_STS` instructions (read of status words).

These exchanges apply to a set of `%MW` objects of the same type (status) belonging to a channel.

NOTE: These objects provide information about the module (e.g.: type of fault on a channel).

General Principle for Using Explicit Instructions

The diagram below shows the different types of explicit exchanges that can be made between the processor and module.



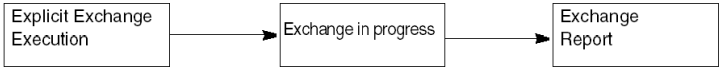
Managing Exchanges

During an explicit exchange, it is necessary to check its performance in order that data is only taken into account when the exchange has been correctly executed.

To do this, two types of information are available:

- Information concerning the exchange in progress
- The exchange report.

The following diagram describes the management principle for an exchange



NOTE: In order to avoid several simultaneous explicit exchanges on the same channel, it is necessary to test the value of the word EXCH_STS (`%MWr.m.c.0`) of the IODDT associated to the channel before to call any EF using this channel.

Details of IODDT Explicit Exchange Objects of Type T_COM_STS_GEN

Introduction

This section presents the T_COM_STS_GEN type IODDT explicit exchange objects applicable to all communication protocols except Fipio and Ethernet. It includes the word type objects whose bits have a specific meaning. These objects are presented in detail below.

Sample Variable Declaration: IODDT_VAR1 of type T_COM_STS_GEN

Observations

- In general, the meaning of the bits is given for bit status 1. In specific cases an explanation is given for each status of the bit.
- Not all bits are used.

Execution Flags of an Explicit Exchange: EXCH_STS

The table below shows the meaning of channel exchange control bits from channel EXCH_STS (%MWr.m.c.0).

Standard Symbol	Type	Access	Meaning	Address
STS_IN_PROGR	BOOL	R	Reading of channel status words in progress.	%MWr.m.c.0.0
CMD_IN_PROGR	BOOL	R	Current parameter exchange in progress.	%MWr.m.c.0.1
ADJ_IN_PROGR	BOOL	R	Adjustment parameter exchange in progress.	%MWr.m.c.0.2

Explicit Exchange Report: EXCH_RPT

The table below presents the meaning of the exchange report bits EXCH_RPT (%MWr.m.c.1).

Standard Symbol	Type	Access	Meaning	Address
STS_ERR	BOOL	R	Reading error for channel status words.	%MWr.m.c.1.0
CMD_ERR	BOOL	R	Error during command parameter exchange.	%MWr.m.c.1.1
ADJ_ERR	BOOL	R	Error during adjustment parameter exchange.	%MWr.m.c.1.2

Standard Channel Faults, CH_FLT

The table below shows the meaning of the bits of the status word CH_FLT (%MWr.m.c.2). Reading is performed by a READ_STS (IODDT_VAR1).

Standard Symbol	Type	Access	Meaning	Address
NO_DEVICE	BOOL	R	No device is working on the channel.	%MWr.m.c.2.0
1_DEVICE_FLT	BOOL	R	A device on the channel is inoperative.	%MWr.m.c.2.1
BLK	BOOL	R	Terminal block not connected.	%MWr.m.c.2.2
TO_ERR	BOOL	R	Time out exceeded anomaly.	%MWr.m.c.2.3
INTERNAL_FLT	BOOL	R	Internal detected error or channel self-testing.	%MWr.m.c.2.4
CONF_FLT	BOOL	R	Different hardware and software configurations.	%MWr.m.c.2.5
COM_FLT	BOOL	R	Interruption of the communication with the PLC.	%MWr.m.c.2.6
APPLI_FLT	BOOL	R	Application detected error (adjustment or configuration).	%MWr.m.c.2.7

Management of Exchanges and Reports with Explicit Objects

At a Glance

When data is exchanged between the PLC memory and the module, the module may require several task cycles to acknowledge this information. All IODDTs use two words to manage exchanges:

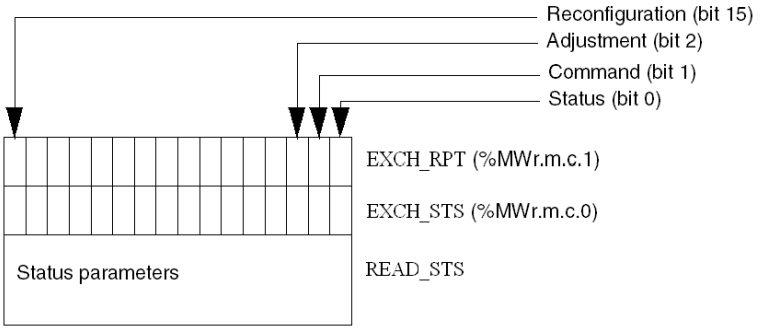
- EXCH_STS (%MWr.m.c.0): exchange in progress,
- EXCH_RPT (%MWr.m.c.1): report.

NOTE: Depending on the localization of the module, the management of the explicit (%MW0.0.MOD.0.0 for example)will not be detected by the application:

- for in-rack modules, explicit exchanges are done immediately on the local PLC Bus and are finished before the end of the execution task, so the READ_STS, for example, is always finished when the%MW.0.0.MOD.0.0 bit is checked by the application.
- for remote bus (Fipio for example), explicit exchanges are not synchronous with the execution task, so the detection is possible by the application.

Illustration

The illustration below shows the different significant bits for managing exchanges:



Description of Significant Bits

The rank 0 bits of the words EXCH_STS (%MWr.m.c.0) and EXCH_RPT (%MWr.m.c.1) are associated with the status parameters:

- The STS_IN_PROGR bit (%MWr.m.c.0.0) indicates whether a read request for the status words is in progress.
- The STS_ERR bit (%MWr.m.c.1.0) specifies whether a read request for the status words is accepted by the module channel.

Execution Indicators for an Explicit Exchange: EXCH_STS

The table below shows the EXCH_STS (%MWr.m.c.0) explicit exchange control bits:

Standard symbol	Type	Access	Meaning	Address
STS_IN_PROGR	BOOL	R	Reading of channel status words in progress	%MWr.m.c.0.0

NOTE: If the module is not present or is disconnected, explicit exchange objects (READ_STS, for example) are not sent to the module (STS_IN_PROG (%MWr.m.c.0.0) = 0), but the words are refreshed.

Explicit Exchange Report: EXCH_RPT

The table below presents the EXCH_RPT (%MWr.m.c.1) report bits:

Standard symbol	Type	Access	Meaning	Address
STS_ERR	BOOL	R	Detected error reading channel status words (1 = failure)	%MWr.m.c.1.0

9.2 Language Object of the CANopen Specific IODDT

Subject of this Section

This section describes the implicit and explicit language objects of the CANopen specific IODDT, `T_COM_CO_BMX`.

What Is in This Section?

This section contains the following topics:

Topic	Page
Details of T_COM_CO_BMX IODDT	197
Details of T_COM_CO_BMX_EXPERT IODDT	210
Language Objects Associated with Configuration	223

Details of T_COM_CO_BMX IODDT

Implicit Exchange Objects of the IODDT

Implicit exchange objects are automatically exchanged at each cycle of a task associated with the channel. These objects are %I, %IW, %Q and %QW.

The table below presents the various implicit exchange objects of IODDT T_COM_CO_BMX.

The parameters r, m and c shown in the following-tables represent the topological addressing of the module. Each parameter has the following signification:

- **r** represents the rack number
- **m** represents the module number
- **c** represents the channel number

Channel Error

The table below presents the bit %Ir.m.c.ERR:

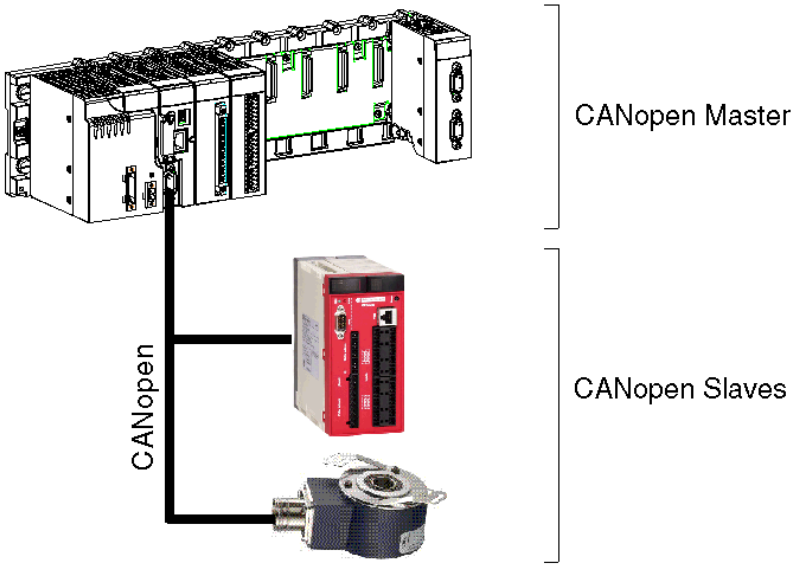
Standard symbol	Type	Access	Description	Address
CH_ERROR	BOOL	R	Channel detected error	%Ir.m.c.ERR

Master Status and Event Indicator

The table below shows the words %IWr.m.c.0 to %IWr.m.c.2:

Standard symbol	Type	Access	Description	Address
COMM_STS	INT	R	Communication status of master	%IWr.m.c.0
CAN_STS	INT	R	Status of CANopen Master	%IWr.m.c.1
EVT_STS	INT	R	Event indicator	%IWr.m.c.2

The following figure gives an example of Master status indicator:



In this example, the word `%IW0.0.2.1` gives the status of the CANopen Master. The parameters are as follows:

- **r**: 0
- **m**: 0
- **c**: 2The master is the only CAN device on the network. It gets no acknowledge to its transmit frames. All nodes marked as absent. The master keeps its state until the "alone" situation is released (CANopen channel)

The last parameter (‘1’) indicates the used word (`CAN_STS`).

The table below shows the meaning of bits from various status words from the master and event indicators:

Addresses	Description	Bit meaning
%IWr.m.c.0	Communication status of master	**Bit 0=1:** Overflow of the reception queue low priority. The CANopen master is receiving "Heartbeat" and "Node guarding" messages as well as SSDOs and CSDOs via the low priority queue. **Bit 1=1:** FIFO overwrite of CAN controller **Bit 2=1:** The CAN controller has status "BUS Off". **Bit 3=1:** CAN controller doesn't run correctly and stops. Bit reset when the condition disappears. **Bit 4=1:** The CAN controller has left abnormal state. **Bit 5=1:** Overflow of the emission queue low priority. The CANopen master is transmitting "Heartbeat" and "Node guarding" messages as well as SSDOs and CSDOs via the low priority transmission queue. **Bit 6=1:** Overflow of the reception queue high priority. The CANopen master is receiving RPDOs, NMT commands, the message Sync and emergency messages via the high priority reception queue. **Bit 7=1:** Overflow of the reception queue high priority. The CANopen master is sending TPDOs, NMT commands, the message Sync and emergency messages via the high priority queue. **Bit 8=1:** Indicates the task cycle is faster than the CANopen master cycle (outputs can be overwritten). To avoid overwrite, you are advised to set a longer task cycle time that the CANopen cycle. The cycle values are available in the words %IWr.m.c.59 to %IWr.m.c.61.

Addresses	Description	Bit meaning
%IWr.m.c.1	Status of CANopen Master	**0x00: INIT:** The CANopen master is not initialized. This corresponds to the "INITIALISATION" status of the CANopen module. In this state, the CANopen master cannot communicate with the network. **0x40: RESET:** The CANopen master is configured as master during "NMT startup". The object dictionary of CANopen master can be configured by SDOs via the CAN bus and the interface of the SDO command. The application has access rights to read/write to the object dictionary via the SDO command. The initialization of network manager has not started yet. **= 0x60: NET –INIT:** Starting according to CIA DSP-302. The CANopen master is checking the allocation of slaves. **= 0x61: NET RESET:** The network is re-initialized by the NMT command "Reset communication all nodes" **= 0x62: NET –WAIT:** The CANopen master is waiting for the modules to be able to run the command "Reset communication". **0x64: BOOT –CONF:** The CANopen master is running the individual initialization of modules according to CIA DSP-302. **0x8x: CLEAR:**The network is scanned. The master is waiting for a start command ("Start CANopen Master/Manager" or "Start network"). **0xAx: RUN** The network is in "Operational" state. **0xCx: STOP** The network is in "Stop" state. **0xEx: PREOPERATIONAL:** The network is in "Pre-operational" status. **0x9x: FATAL ERROR:** An unexpected behavior has occurred. The CANopen master must be re-initialized. The network is scanned. The four most significant bits of the status variable indicate the state of the network (CLEAR, RUN, STOP, PREOPERATIONAL). The four less significant bits contain additional information: Bit 0: Error bit for optional modules. ● = 0: OK. ● = 1: At least one of the optional modules doesn't correspond to the configuration of the expected network. Bit 1: Error bit for obligatory modules. ● = 0: OK. ● = 1: At least one of the obligatory modules is not in the expected status. Bit 2: Bit "Operational" ● = 0: No module including the CANopen Master is in CANopen "Operational" status ● = 1: At least one of the modules is in "Operational" status (excluding the CANopen Master) Bit 3: "Operational" bit of CANopen Master ● = 0: The CANopen master is not in "Operational" state ● = 1: The CANopen Master is in "Operational" status.

Addresses	Description	Bit meaning
%IWr.m.c.2	Event indicator	**Bit 0 = 1:** This bit is always set when a detected error has occurred in the communication with the network. The communication status of CANopen Master gives the exact reason. (The CANopen master is unable to run correctly and stops). **Bit 1 = 1:** A module is using the node number of CANopen Master. (The CANopen master is unable to run correctly and stops). **Bit 2 = 1:** Detected error control event of a mandatory module. The reaction to this event depends on the configuration of the NMT startup object. This bit is relevant if the configuration of the NMT startup object does not stipulate a reset of the whole network including the CANopen master. In this case, a reset is carried out without the application being informed beforehand. **Bit 3 = 1:** Identity detected error or incorrect DCF of a mandatory module. (The CANopen master is unable to run correctly and stops). **Bit 4 = 1:** The concerned module is in "Stop" state. **Bit 5 = 1:** During auto-configuration, the creation of a configuration of the process image and the PDOs are incorrect. (The CANopen master is unable to run correctly and stops). **Bit 6 = 1:** During the network scanning in the auto-configuration mode, a detected error control event of an already scanned module occurred. (The CANopen master is unable to run correctly and stops) **Bit 7 = 1:** This bit is always set if a bit in one of the bit list changes. **Bit 8 = 1:** At the beginning of the Boot Up procedure, the CANopen master checks the individual slave assignment. This bit is set by the slave assignment of a module contain features which are not supported by the CANopen master (e.g bit 4 to bit 6 of object 1F81H). (The CANopen master is unable to run correctly and stops). **Bit 9 = 1:** The CANopen Master has received an RPDO with too few databytes. (The CANopen master is unable to run correctly and stops). **Bit 10 = 1:** A concise DCF is faulty: If the state < CLEAR then the CANopen master is unable to run correctly and stops; if the state >= CLEAR then the indication is in the event queue and slave is not rebooted. There is a mismatch between the DCF and the slave's Object Dictionary, resulting in the SDO abort during the concise DCF's download: the indication is in the event queue and the manager retries the download of the DCF; or the indication does not match with the Object Dictionary of the slave module, therefore the CANopen master is unable to run correctly and stops. **Bit 11 = 1:** This bit indicates an indication queue overrun of the application-specific SDO interface. **Bit 12 = 1:** The last master cycle time is greater than 256 ms. **Bit 13 = 1:** The master is the only CAN device on the network. It gets no acknowledgment to its transmitted frames. All nodes are marked as absent. The master keeps its state until the "alone" situation is released. **Bit 14 = 1:** Reserved. **Bit 15 = 1:** The Master is alone on the bus (Check that the cable is connected).

Assigned Slaves

The table below shows the words %IWr.m.c.3 to %IWr.m.c.6:

Standard symbol	Type	Access	Description	Address
SLAVE_ASSIGNED_1_16	INT	R	For assigned slaves from 1 to 16	%IWr.m.c.3
SLAVE_ASSIGNED_17_32	INT	R	For assigned slaves from 17 to 32	%IWr.m.c.4
SLAVE_ASSIGNED_33_48	INT	R	For assigned slaves from 33 to 48	%IWr.m.c.5
SLAVE_ASSIGNED_49_63	INT	R	For assigned slaves from 49 to 63	%IWR.m.c.6

If the bit is equal to 0, no slave is assigned to this bit.

If the bit is equal to 1, a slave is assigned to this bit.

The node number corresponds to the number of the bit + 1.

Slaves Configured

The table below shows the words %IWr.m.c.11 to %IWr.m.c.14:

Standard symbol	Type	Access	Description	Address
SLAVE_CONF_1_16	INT	R	For configured slaves from 1 to 16	%IWr.m.c.11
SLAVE_CONF_17_32	INT	R	For configured slaves from 17 to 32	%IWr.m.c.12
SLAVE_CONF_33_48	INT	R	For configured slaves from 33 to 48	%IWr.m.c.13
SLAVE_CONF_49_63	INT	R	For configured slaves from 49 to 63	%IWr.m.c.14

If the bit is equal to 0, the slave is not configured and cannot start.

If the bit is equal to 1, the slave is configured and can be started.

The node number corresponds to the number of the bit + 1.

Slaves with Configuration Faults

The table below shows the words %IWr.m.c.19 to %IWr.m.c.22:

Standard symbol	Type	Access	Description	Address
SLAVE_FLT_1_16	INT	R	Slaves with configuration faults from 1 to 16	%IWr.m.c.19
SLAVE_FLT_17_32	INT	R	Slaves with configuration faults from 17 to 32	%IWr.m.c.20
SLAVE_FLT_33_48	INT	R	Slaves with configuration faults from 33 to 48	%IWr.m.c.21
SLAVE_FLT_49_63	INT	R	Slaves with configuration faults from 49 to 63	%IWr.m.c.22

If the bit is equal to 0, the assigned slave corresponds to the configuration.

If the bit is equal to 1, the assigned slave does not correspond to the configuration.

The node number corresponds to the number of the bit + 1.

Inoperative Slaves

The table below shows the words %IWr.m.c.27 to %IWr.m.c.30:

Standard symbol	Type	Access	Description	Address
SLAVE_EMCY_1_16	INT	R	Slaves from 1 to 16	%IWr.m.c.27
SLAVE_EMCY_17_32	INT	R	Slaves from 17 to 32	%IWr.m.c.28
SLAVE_EMCY_33_48	INT	R	Slaves from 33 to 48	%IWr.m.c.29
SLAVE_EMCY_49_63	INT	R	Slaves from 49 to 63	%IWr.m.c.30

If the bit is equal to 0, the slave is properly operating.

If the bit is equal to 1, the slave is improperly operating.

The node number corresponds to the number of the bit + 1.

Operational Slaves from 1 to 16

The table below presents the word %IWr.m.c.35:

Standard symbol	Type	Access	Description	Address
SLAVE_ACTIV_1	BOOL	R	Slave operational on the bus: device 1	%IWr.m.c.35.0
SLAVE_ACTIV_2	BOOL	R	Slave operational on the bus: device 2	%IWr.m.c.35.1
SLAVE_ACTIV_3	BOOL	R	Slave operational on the bus: device 3	%IWr.m.c.35.2
SLAVE_ACTIV_4	BOOL	R	Slave operational on the bus: device 4	%IWr.m.c.35.3
SLAVE_ACTIV_5	BOOL	R	Slave operational on the bus: device 5	%IWr.m.c.35.4
SLAVE_ACTIV_6	BOOL	R	Slave operational on the bus: device 6	%IWr.m.c.35.5
SLAVE_ACTIV_7	BOOL	R	Slave operational on the bus: device 7	%IWr.m.c.35.6
SLAVE_ACTIV_8	BOOL	R	Slave operational on the bus: device 8	%IWr.m.c.35.7
SLAVE_ACTIV_9	BOOL	R	Slave operational on the bus: device 9	%IWr.m.c.35.8
SLAVE_ACTIV_10	BOOL	R	Slave operational on the bus: device 10	%IWr.m.c.35.9
SLAVE_ACTIV_11	BOOL	R	Slave operational on the bus: device 11	%IWr.m.c.35.10
SLAVE_ACTIV_12	BOOL	R	Slave operational on the bus: device 12	%IWr.m.c.35.11
SLAVE_ACTIV_13	BOOL	R	Slave operational on the bus: device 13	%IWr.m.c.35.12
SLAVE_ACTIV_14	BOOL	R	Slave operational on the bus: device 14	%IWr.m.c.35.13
SLAVE_ACTIV_15	BOOL	R	Slave operational on the bus: device 15	%IWr.m.c.35.14
SLAVE_ACTIV_16	BOOL	R	Slave operational on the bus: device 16	%IWr.m.c.35.15

The node number corresponds to the number of the bit + 1.

Operational Slaves from 17 to 32

The table below presents the word %IWr.m.c.36:

Standard symbol	Type	Access	Description	Address
SLAVE_ACTIV_17	BOOL	R	Slave operational on the bus: device 17	%IWr.m.c.36.0
SLAVE_ACTIV_18	BOOL	R	Slave operational on the bus: device 18	%IWr.m.c.36.1
SLAVE_ACTIV_19	BOOL	R	Slave operational on the bus: device 19	%IWr.m.c.36.2
SLAVE_ACTIV_20	BOOL	R	Slave operational on the bus: device 20	%IWr.m.c.36.3
SLAVE_ACTIV_21	BOOL	R	Slave operational on the bus: device 21	%IWr.m.c.36.4
SLAVE_ACTIV_22	BOOL	R	Slave operational on the bus: device 22	%IWr.m.c.36.5
SLAVE_ACTIV_23	BOOL	R	Slave operational on the bus: device 23	%IWr.m.c.36.6
SLAVE_ACTIV_24	BOOL	R	Slave operational on the bus: device 24	%IWr.m.c.36.7
SLAVE_ACTIV_25	BOOL	R	Slave operational on the bus: device 25	%IWr.m.c.36.8
SLAVE_ACTIV_26	BOOL	R	Slave operational on the bus: device 26	%IWr.m.c.36.9
SLAVE_ACTIV_27	BOOL	R	Slave operational on the bus: device 27	%IWr.m.c.36.10
SLAVE_ACTIV_28	BOOL	R	Slave operational on the bus: device 28	%IWr.m.c.36.11
SLAVE_ACTIV_29	BOOL	R	Slave operational on the bus: device 29	%IWr.m.c.36.12
SLAVE_ACTIV_30	BOOL	R	Slave operational on the bus: device 30	%IWr.m.c.36.13
SLAVE_ACTIV_31	BOOL	R	Slave operational on the bus: device 31	%IWr.m.c.36.14
SLAVE_ACTIV_32	BOOL	R	Slave operational on the bus: device 32	%IWr.m.c.36.15

Operational Slaves from 33 to 48

The table below shows the word %IWr.m.c.37:

Standard symbol	Type	Access	Description	Address
SLAVE_ACTIV_33	BOOL	R	Slave operational on the bus: device 33	%IWr.m.c.37.0
SLAVE_ACTIV_34	BOOL	R	Slave operational on the bus: device 34	%IWr.m.c.37.1
SLAVE_ACTIV_35	BOOL	R	Slave operational on the bus: device 35	%IWr.m.c.37.2
SLAVE_ACTIV_36	BOOL	R	Slave operational on the bus: device 36	%IWr.m.c.37.3
SLAVE_ACTIV_37	BOOL	R	Slave operational on the bus: device 37	%IWr.m.c.37.4
SLAVE_ACTIV_38	BOOL	R	Slave operational on the bus: device 38	%IWr.m.c.37.5
SLAVE_ACTIV_39	BOOL	R	Slave operational on the bus: device 39	%IWr.m.c.37.6
SLAVE_ACTIV_40	BOOL	R	Slave operational on the bus: device 40	%IWr.m.c.37.7
SLAVE_ACTIV_41	BOOL	R	Slave operational on the bus: device 41	%IWr.m.c.37.8
SLAVE_ACTIV_42	BOOL	R	Slave operational on the bus: device 42	%IWr.m.c.37.9
SLAVE_ACTIV_43	BOOL	R	Slave operational on the bus: device 43	%IWr.m.c.37.10
SLAVE_ACTIV_44	BOOL	R	Slave operational on the bus: device 44	%IWr.m.c.37.11
SLAVE_ACTIV_45	BOOL	R	Slave operational on the bus: device 45	%IWr.m.c.37.12
SLAVE_ACTIV_46	BOOL	R	Slave operational on the bus: device 46	%IWr.m.c.37.13
SLAVE_ACTIV_47	BOOL	R	Slave operational on the bus: device 47	%IWr.m.c.37.14
SLAVE_ACTIV_48	BOOL	R	Slave operational on the bus: device 48	%IWr.m.c.37.15

Operational Slaves from 49 to 63

The table below shows the word %IWr.m.c.38:

Standard symbol	Type	Access	Description	Address
SLAVE_ACTIV_49	BOOL	R	Slave operational on the bus: device 49	%IWr.m.c.38.0
SLAVE_ACTIV_50	BOOL	R	Slave operational on the bus: device 50	%IWr.m.c.38.1
SLAVE_ACTIV_51	BOOL	R	Slave operational on the bus: device 51	%IWr.m.c.38.2
SLAVE_ACTIV_52	BOOL	R	Slave operational on the bus: device 52	%IWr.m.c.38.3
SLAVE_ACTIV_53	BOOL	R	Slave operational on the bus: device 53	%IWr.m.c.38.4
SLAVE_ACTIV_54	BOOL	R	Slave operational on the bus: device 54	%IWr.m.c.38.5
SLAVE_ACTIV_55	BOOL	R	Slave operational on the bus: device 55	%IWr.m.c.38.6
SLAVE_ACTIV_56	BOOL	R	Slave operational on the bus: device 56	%IWr.m.c.38.7
SLAVE_ACTIV_57	BOOL	R	Slave operational on the bus: device 57	%IWr.m.c.38.8
SLAVE_ACTIV_58	BOOL	R	Slave operational on the bus: device 58	%IWr.m.c.38.9
SLAVE_ACTIV_59	BOOL	R	Slave operational on the bus: device 59	%IWr.m.c.38.10
SLAVE_ACTIV_60	BOOL	R	Slave operational on the bus: device 60	%IWr.m.c.38.11

Standard symbol	Type	Access	Description	Address
SLAVE_ACTIV_61	BOOL	R	Slave operational on the bus: device 61	%IWr.m.c.38.12
SLAVE_ACTIV_62	BOOL	R	Slave operational on the bus: device 62	%IWr.m.c.38.13
SLAVE_ACTIV_63	BOOL	R	Slave operational on the bus: device 63	%IWr.m.c.38.14

Slave in Stop State

The table below shows the words %IWr.m.c.43 to %IWr.m.c.46:

Standard symbol	Type	Access	Description	Address
SLAVE_STOPPED_1_16	INT	R	Stopped slaves from 1 to 16	%IWr.m.c.43
SLAVE_STOPPED_17_32	INT	R	Stopped slaves from 17 to 32	%IWr.m.c.44
SLAVE_STOPPED_33_48	INT	R	Stopped slaves from 33 to 48	%IWr.m.c.45
SLAVE_STOPPED_49_63	INT	R	Stopped slaves from 49 to 63	%IWr.m.c.46

Pre-Operational Slaves

The table below shows the words %IWr.m.c.51 to %IWr.m.c.54:

Standard symbol	Type	Access	Description	Address
SLAVE_PREOP_1_16	INT	R	Pre-operational slaves from 1 to 16.	%IWr.m.c.51
SLAVE_PREOP_17_32	INT	R	Pre-operational slaves from 17 to 32.	%IWr.m.c.52
SLAVE_PREOP_33_48	INT	R	Pre-operational slaves from 33 to 48.	%IWr.m.c.53
SLAVE_PREOP_49_63	INT	R	Pre-operational slaves from 49 to 63.	%IWr.m.c.54

Master Cycle Time

The table below shows the meaning of status words relative to the time cycle of the master:

Addresses	Description	Meaning
%IWr.m.c.59	Minimum master cycle time	Minimum value of the CANopen master cycle time in ms.
%IWr.m.c.60	Current master cycle time	Current value of the CANopen master cycle time in ms.
%IWr.m.c.61	Maximum master cycle time	Maximum value of the CANopen master cycle time in ms.

The following symbols are accessible %IW.r.m.c.59 to %IW.r.m.c.61:

- INT_ERR_BIT -> Bit 0

Reset Emergency Default

The table below shows the meaning of the Reset Emergency Default objects:

Addresses	Description	Standard Symbol	Bit meaning
%QWr.m.c.0	Command word of the CANopen master	INT_ERR_BIT	**Bit 0 = 1:** Reset emergency slaves bit list. This bit is set to zero after the reset of the bitlist.
			Bit 1 = 1: Reset bit 8 (overrun) in common status (%IW0.0.2.0). The bit 1 is set to zero after the reset of the bit 8.
			Bit 2 = 1: Reset bit 7 (change bit list) of event indicator (%IW0.0.2.2).The bit 2 is set to zero after the reset of the bit 7.
			Bit 3 = 1: Reset quality information: %ID0.y.2.66 to %IW0.y.2.72. This bit is set to zero after the reset of the words and the measure restarts.
			Bit 4 = 1: Reset bus load information:%IW0.y.2.62 to %IW0.y.2.64. This bit is set to zero after the reset of the words and the measure restarts.
			Bit 5 = 1: Reset the CANopen master (useful to restart in Fatal Error without power down/up).The bit is set to zero after the reset of the master.
			Bit 6 to bit 15: Reserved

Explicit Exchanges Objects of the IODDT

This part shows the explicit exchange language objects for the CANopen master.

These objects are exchanged on the application's request, using the instruction READ_STS.

The parameters r, m and c shown in the following tables represent the topological addressing of the module. Each parameter has the following signification:

- **r**: represents the rack number,
- **m**: represents the position of the module on the rack,
- **c**: represents the channel number.

Execution Indicator: EXCH_STS

The table below shows the meanings of channel exchange control bits from channel EXCH_STS (%MWr.m.c.0):

Symbol	Type	Access	Description	Number
STS_IN_PROGR	BOOL	R	Status parameter read in progress	%MWr.m.c.0.0

Exchange Report: EXCH_RPT

The table below presents the meaning of the run report bits of the channel EXCH_RPT (%MWr.m.c.1):

Symbol	Type	Access	Description	Number
STS_ERR	BOOL	R	Detected error while reading channel status	%MWr.m.c.1.0

Standard Channel Faults: CH_FLT

The following table explains the meaning of the CH_FLT (%MWr.m.c.2) status word bits. Reading is performed by a READ_STS:

Object	Function	Standard Symbol	Type	Access	Meaning
%MWr.m.c.2	Status of the CANopen Master	CAN_FLT	BOOL	R	**Bit 0 = 1:** The CANopen Master is not in operational state.
		FEW_SLAVE_FLT	BOOL	R	**Bit 1 = 1:** One or more slaves are not in an operational state.
		CAN_OFF	BOOL	R	**Bit 2:** Reserved.
		CONF_FLT	BOOL	R	**Bit 3 = 1:** Configuration detected error.
					Bit 4 to bit 7: Reserved. **Bit 8 to Bit 10:** CAN ERR led: • 000 = off • 001 = single flash • 010 = double flash • 011 = triple flash • 111 = on **Bit 11 to Bit 13:** CAN RUN led: • 001 = single flash • 100 = blinking • 111 = on **Bit 14 to Bit 15:** Reserved.
%MWr.m.c.3	Generic detected error count				Number of received emergency messages with code 10xxH
%MWr.m.c.4	Device hardware detected error count				Number of received emergency messages with code 50xxH
%MWr.m.c.5	Device software detected error count				Number of received emergency messages with code 60xxH

Object	Function	Standard Symbol	Type	Access	Meaning
%MWr.m.c.6	Communication detected error count				Number of received emergency messages with code 81xxH
%MWr.m.c.7	Protocol detected error count				Number of received emergency messages with code 82xxH
%MWr.m.c.8	External detected error count				Number of received emergency messages with code 90xxH
%MWr.m.c.9	Device-specific				Number of received emergency messages with code FFxxH

Details of T_COM_CO_BMX_EXPERT IODDT

Implicit Exchange Objects of the IODDT

Implicit exchange objects are automatically exchanged at each cycle of a task associated with the channel. These objects are %I, %IW, %Q and %QW.

The table below presents the various implicit exchange objects of IODDT T_COM_CO_BMX_EXPERT.

The parameters r, m and c shown in the following-tables represent the topological addressing of the module. Each parameter has the following signification:

- **r** represents the rack number
- **m** represents the module number
- **c** represents the channel number

Channel Error

The table below presents the bit %Ir.m.c.ERR:

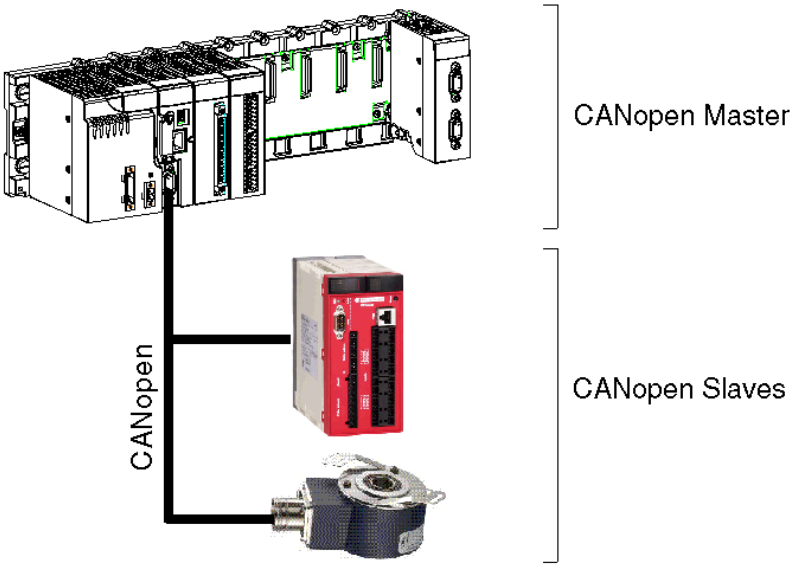
Standard symbol	Type	Access	Description	Address
CH_ERROR	BOOL	R	Channel detected error	%Ir.m.c.ERR

Master Status and Event Indicator

The table below shows the words %IWr.m.c.0 to %IWr.m.c.2:

Standard symbol	Type	Access	Description	Address
COMM_STS	INT	R	Communication status of Master	%IWr.m.c.0
CAN_STS	INT	R	Status of CANopen Master	%IWr.m.c.1
EVT_STS	INT	R	Event indicator	%IWr.m.c.2

The following figure gives an example of Master status indicator.



In this example, the word `%IW0.0.2.1` gives the status of the CANopen Master. The parameters are as follows:

- **r**: 0
- **m**: 0
- **c**: 2 (CANopen channel)

The last parameter (‘1’) indicates the used word (`CAN_STS`).

The table below shows the meaning of bits from various status words from the master and event indicators:

Addresses	Description	Bit meaning
%IWr.m.c.0	Communication status of Master	**Bit 0 = 1**: Overflow of the low priority reception queue. The CANopen Master receives "Heartbeat" and "Node guarding" messages as well as SSDOs and CSDOs via the low priority queue. **Bit 1 = 1**: FIFO overwrites the CAN controller. **Bit 2 = 1**: The CAN controller has the status **BUS OFF**. **Bit 3 = 1**: CAN controller doesn't run correctly and stops. This bit is reset when the condition disappears. **Bit 4 = 1**:The CAN controller has left an abnormal state. **Bit 5 = 1**: Overflow of the low priority emission queue. The CANopen Master transmits "Heartbeat" and "Node guarding" messages as well as SSDOs and CSDOs via the low priority transmission queue. **Bit 6 = 1**: Overflow of the high priority reception queue. The CANopen Master receives RPDOs, NMT commands, the message Sync and emergency messages via the high priority reception queue. **Bit 7 = 1**: Overflow of the high priority transmit queue. The CANopen Master sends TPDOs, NMT commands, the message Sync and emergency messages via the high priority queue. **Bit 8 = 1**: Indicates that the task cycle is faster than the CANopen Master cycle (outputs can be overwritten). To avoid overwriting, it is recommened to set a longer task cycle time than the CANopen cycle. The cycle values are available in the words %IWr.m.c.59 to %IWr.m.c.61.

Addresses	Description	Bit meaning

%IWr.m.c.1	Status of CANopen Master	= 0x00 **INIT**: The CANopen Master is not initialized. This corresponds to the **INITIALISATION** status of the CANopen module. In this state, the CANopen Master cannot communicate with the network.
		= 0x40 **RESET**: The CANopen Master is configured as master during **NMT STARTUP**. The object dictionary of CANopen Master can be configured by SDOs via the CAN bus and the interface of the SDO command. The application has read/write access rights to the object dictionary via the SDO command. The initialization of network manager has not yet started.
		= 0x60 **NET INIT**: Start-up according to CIA DSP-302. The CANopen Master checks the allocation of the slaves.
		= 0x61 **NET RESET**: The network is re-initialized by the NMT command **RESET COMMUNICATION ALL NODES**.
		= 0x62 **NET WAIT**: The CANopen Master waits (waiting time be defined) to allow the modules to run the command **RESET COMMUNICATION**.
		= 0x64 **BOOT CONF**: The CANopen Master initializes modules according to CIA DSP-302 by scanning the network.
		The high nibble of the state variable indicates the general network state: **CLEAR**, **RUN**, **STOP** and **PREOPERATIONAL**.
		The low nibble contains additional information:
		● **Bit 0**: Detected error bit for optional and unexpected modules:
		  ● **0**: No error is detected.
		  ● **1**: There is at least one optional or unexpected module that does not correspond to the expected network configuration.
		● **Bit 2**: General operational bit:
		  ● **0**: No module (including the CANopen Master) is in the CANopen **OPERATIONAL** state.
		  ● **1**: At least one module (but not including the CANopen Master) is in the CANopen **OPERATIONAL** state.
		● **Bit 3**: General operational bit:
		  ● **0**: The CANopen Master is not in the **OPERATIONAL** state.
		  ● **1**: The CANopen Master is in the **OPERATIONAL** state.
		= 0x8x **CLEAR**: The network is scanned. The Master is waiting for a start command (**START CANopen MASTER/MANAGER** or **START NETWORK**).
		= 0xAx **RUN**: The network is in the **OPERATIONAL** state.
		= 0xCx **STOP**: The network is in the **STOP** state.
		= 0xEx **PREOPERATIONAL**: The network is in the **PREOPERATIONAL** state.
		= 0x9x **FATAL ERROR**: The CANopen Master is inoperative and must be re-initialized.

Addresses	Description	Bit meaning
%IW0.y.2.2	Event indicator	**Bit 0 = 1**: This bit is always set when a detected error has occurred in communication with the network. The communication status of CANopen Master gives the exact reason. (The CANopen Master is unable to run correctly and stops). **Bit 1 = 1**: A module is using the node number of CANopen Master. (The CANopen Master is unable to run correctly and stops). **Bit 2 and Bit 3**: Reserved. **Bit 4 = 1**: There is a detected identity error for an optional module. The boot slave process is repeated. **Bit 5 and Bit 6**: Reserved. **Bit 7 = 1**:This bit is set if a bit in one of the bitlists changes. **Bit 8 = 1**: At the beginning of the start-up procedure, the CANopen Master checks the individual slave assignments. This bit is set by the slave assignment if a module that contain features which are not supported by the CANopen Master (for example, bit 4 to bit 6 of object 1F81H: the CANopen Master is unable to run correctly and stops). **Bit 9 = 1**: The CANopen Master has received an RPDO with not enough data bytes. (The CANopen Master does not change its state.) **Bit 10 = 1**: Inconsistent or mismatch DCF bit. If a DCF inconsistent error is detected and if the state is: ● < **CLEAR**, then the CANopen Master is unable to run correctly and stops ● >= **CLEAR**, then there is an indication in the event queue and slave is not rebooted If there is a mismatch between a DCF and the slave's Object Dictionary, which results in an SDO abort during the DCF download, then there is an indication in the event queue and the manager retries downloading the DCF. **Bit 11**: Reserved. **Bit 12 = 1**: The last Master/Manager cycle time is greater than 256 ms. **Bit 13 = 1**: The Master is the only CAN device on the network. It gets no acknowledgment to its transmitted frames. All nodes are marked as absent. The Master keeps its state until the "alone" situation is released. **Bit 14 and Bit 15**: Reserved.

Assigned Slaves

The table below shows the words `%IWr.m.c.3` to `%IWr.m.c.10`:

Standard symbol	Type	Access	Description	Address
SLAVE_ASSIGNED_1_16	INT	R	For assigned slaves from 1 to 16	`%IWr.m.c.3`
SLAVE_ASSIGNED_17_32	INT	R	For assigned slaves from 17 to 32	`%IWr.m.c.4`
SLAVE_ASSIGNED_33_48	INT	R	For assigned slaves from 33 to 48	`%IWr.m.c.5`
SLAVE_ASSIGNED_49_63	INT	R	For assigned slaves from 49 to 63	`%IWR.m.c.6`

If the bit is equal to 0, no slave is assigned to this bit.

If the bit is equal to 1, a slave is assigned to this bit.

The node number corresponds to the number of the bit + 1.

Slaves Configured

The table below shows the words %IWr.m.c.11 to %IWr.m.c.14:

Standard symbol	Type	Access	Description	Address
SLAVE_CONF_1_16	INT	R	For configured slaves from 1 to 16	%IWr.m.c.11
SLAVE_CONF_17_32	INT	R	For configured slaves from 17 to 32	%IWr.m.c.12
SLAVE_CONF_33_48	INT	R	For configured slaves from 33 to 48	%IWr.m.c.13
SLAVE_CONF_49_63	INT	R	For configured slaves from 49 to 63	%IWr.m.c.14

If the bit is equal to 0, the slave is not configured and cannot start.

If the bit is equal to 1, the slave is configured and can be started.

The node number corresponds to the number of the bit + 1.

Slaves with Configuration Faults

The table below shows the words %IWr.m.c.19 to %IWr.m.c.22:

Standard symbol	Type	Access	Description	Address
SLAVE_FLT_1_16	INT	R	Slaves with configuration faults from 1 to 16	%IWr.m.c.19
SLAVE_FLT_17_32	INT	R	Slaves with configuration faults from 17 to 32	%IWr.m.c.20
SLAVE_FLT_33_48	INT	R	Slaves with configuration faults from 33 to 48	%IWr.m.c.21
SLAVE_FLT_49_63	INT	R	Slaves with configuration faults from 49 to 63	%IWr.m.c.22

If the bit is equal to 0, the assigned slave corresponds to the configuration.

If the bit is equal to 1, the assigned slave does not correspond to the configuration.

The node number corresponds to the number of the bit + 1.

Inoperative Slaves

The table below shows the words %IWr.m.c.27 to %IWr.m.c.30:

Standard symbol	Type	Access	Description	Address
SLAVE_EMCY_1_16	INT	R	Slaves from 1 to 16	%IWr.m.c.27
SLAVE_EMCY_17_32	INT	R	Slaves from 17 to 32	%IWr.m.c.28
SLAVE_EMCY_33_48	INT	R	Slaves from 33 to 48	%IWr.m.c.29
SLAVE_EMCY_49_63	INT	R	Slaves from 49 to 63	%IWr.m.c.30

If the bit is equal to 0, the slave is properly operating.

If the bit is equal to 1, the slave is improperly operating.

The node number corresponds to the number of the bit + 1.

Operational Slaves from 1 to 16

The table below presents the word %IWr.m.c.35:

Standard symbol	Type	Access	Description	Address
SLAVE_ACTIV_1	BOOL	R	Slave operational on the bus: device 1	%IWr.m.c.35.0
SLAVE_ACTIV_2	BOOL	R	Slave operational on the bus: device 2	%IWr.m.c.35.1
SLAVE_ACTIV_3	BOOL	R	Slave operational on the bus: device 3	%IWr.m.c.35.2
SLAVE_ACTIV_4	BOOL	R	Slave operational on the bus: device 4	%IWr.m.c.35.3
SLAVE_ACTIV_5	BOOL	R	Slave operational on the bus: device 5	%IWr.m.c.35.4
SLAVE_ACTIV_6	BOOL	R	Slave operational on the bus: device 6	%IWr.m.c.35.5
SLAVE_ACTIV_7	BOOL	R	Slave operational on the bus: device 7	%IWr.m.c.35.6
SLAVE_ACTIV_8	BOOL	R	Slave operational on the bus: device 8	%IWr.m.c.35.7
SLAVE_ACTIV_9	BOOL	R	Slave operational on the bus: device 9	%IWr.m.c.35.8
SLAVE_ACTIV_10	BOOL	R	Slave operational on the bus: device 10	%IWr.m.c.35.9
SLAVE_ACTIV_11	BOOL	R	Slave operational on the bus: device 11	%IWr.m.c.35.10
SLAVE_ACTIV_12	BOOL	R	Slave operational on the bus: device 12	%IWr.m.c.35.11
SLAVE_ACTIV_13	BOOL	R	Slave operational on the bus: device 13	%IWr.m.c.35.12
SLAVE_ACTIV_14	BOOL	R	Slave operational on the bus: device 14	%IWr.m.c.35.13
SLAVE_ACTIV_15	BOOL	R	Slave operational on the bus: device 15	%IWr.m.c.35.14
SLAVE_ACTIV_16	BOOL	R	Slave operational on the bus: device 16	%IWr.m.c.35.15

The node number corresponds to the number of the bit + 1.

Operational Slaves from 17 to 32

The table below presents the word %IWr.m.c.36:

Standard symbol	Type	Access	Description	Address
SLAVE_ACTIV_17	BOOL	R	Slave operational on the bus: device 17	%IWr.m.c.36.0
SLAVE_ACTIV_18	BOOL	R	Slave operational on the bus: device 18	%IWr.m.c.36.1
SLAVE_ACTIV_19	BOOL	R	Slave operational on the bus: device 19	%IWr.m.c.36.2
SLAVE_ACTIV_20	BOOL	R	Slave operational on the bus: device 20	%IWr.m.c.36.3
SLAVE_ACTIV_21	BOOL	R	Slave operational on the bus: device 21	%IWr.m.c.36.4
SLAVE_ACTIV_22	BOOL	R	Slave operational on the bus: device 22	%IWr.m.c.36.5
SLAVE_ACTIV_23	BOOL	R	Slave operational on the bus: device 23	%IWr.m.c.36.6
SLAVE_ACTIV_24	BOOL	R	Slave operational on the bus: device 24	%IWr.m.c.36.7
SLAVE_ACTIV_25	BOOL	R	Slave operational on the bus: device 25	%IWr.m.c.36.8
SLAVE_ACTIV_26	BOOL	R	Slave operational on the bus: device 26	%IWr.m.c.36.9

Standard symbol	Type	Access	Description	Address
SLAVE_ACTIV_27	BOOL	R	Slave operational on the bus: device 27	%IWr.m.c.36.10
SLAVE_ACTIV_28	BOOL	R	Slave operational on the bus: device 28	%IWr.m.c.36.11
SLAVE_ACTIV_29	BOOL	R	Slave operational on the bus: device 29	%IWr.m.c.36.12
SLAVE_ACTIV_30	BOOL	R	Slave operational on the bus: device 30	%IWr.m.c.36.13
SLAVE_ACTIV_31	BOOL	R	Slave operational on the bus: device 31	%IWr.m.c.36.14
SLAVE_ACTIV_32	BOOL	R	Slave operational on the bus: device 32	%IWr.m.c.36.15

Operational Slaves from 33 to 48

The table below shows the word %IWr.m.c.37:

Standard symbol	Type	Access	Description	Address
SLAVE_ACTIV_33	BOOL	R	Slave operational on the bus: device 33	%IWr.m.c.37.0
SLAVE_ACTIV_34	BOOL	R	Slave operational on the bus: device 34	%IWr.m.c.37.1
SLAVE_ACTIV_35	BOOL	R	Slave operational on the bus: device 35	%IWr.m.c.37.2
SLAVE_ACTIV_36	BOOL	R	Slave operational on the bus: device 36	%IWr.m.c.37.3
SLAVE_ACTIV_37	BOOL	R	Slave operational on the bus: device 37	%IWr.m.c.37.4
SLAVE_ACTIV_38	BOOL	R	Slave operational on the bus: device 38	%IWr.m.c.37.5
SLAVE_ACTIV_39	BOOL	R	Slave operational on the bus: device 39	%IWr.m.c.37.6
SLAVE_ACTIV_40	BOOL	R	Slave operational on the bus: device 40	%IWr.m.c.37.7
SLAVE_ACTIV_41	BOOL	R	Slave operational on the bus: device 41	%IWr.m.c.37.8
SLAVE_ACTIV_42	BOOL	R	Slave operational on the bus: device 42	%IWr.m.c.37.9
SLAVE_ACTIV_43	BOOL	R	Slave operational on the bus: device 43	%IWr.m.c.37.10
SLAVE_ACTIV_44	BOOL	R	Slave operational on the bus: device 44	%IWr.m.c.37.11
SLAVE_ACTIV_45	BOOL	R	Slave operational on the bus: device 45	%IWr.m.c.37.12
SLAVE_ACTIV_46	BOOL	R	Slave operational on the bus: device 46	%IWr.m.c.37.13
SLAVE_ACTIV_47	BOOL	R	Slave operational on the bus: device 47	%IWr.m.c.37.14
SLAVE_ACTIV_48	BOOL	R	Slave operational on the bus: device 48	%IWr.m.c.37.15

Operational Slaves from 49 to 64

The table below shows the word %IWr.m.c.38:

Standard symbol	Type	Access	Description	Address
SLAVE_ACTIV_49	BOOL	R	Slave operational on the bus: device 49	%IWr.m.c.38.0
SLAVE_ACTIV_50	BOOL	R	Slave operational on the bus: device 50	%IWr.m.c.38.1
SLAVE_ACTIV_51	BOOL	R	Slave operational on the bus: device 51	%IWr.m.c.38.2
SLAVE_ACTIV_52	BOOL	R	Slave operational on the bus: device 52	%IWr.m.c.38.3

Standard symbol	Type	Access	Description	Address
SLAVE_ACTIV_53	BOOL	R	Slave operational on the bus: device 53	%IWr.m.c.38.4
SLAVE_ACTIV_54	BOOL	R	Slave operational on the bus: device 54	%IWr.m.c.38.5
SLAVE_ACTIV_55	BOOL	R	Slave operational on the bus: device 55	%IWr.m.c.38.6
SLAVE_ACTIV_56	BOOL	R	Slave operational on the bus: device 56	%IWr.m.c.38.7
SLAVE_ACTIV_57	BOOL	R	Slave operational on the bus: device 57	%IWr.m.c.38.8
SLAVE_ACTIV_58	BOOL	R	Slave operational on the bus: device 58	%IWr.m.c.38.9
SLAVE_ACTIV_59	BOOL	R	Slave operational on the bus: device 59	%IWr.m.c.38.10
SLAVE_ACTIV_60	BOOL	R	Slave operational on the bus: device 60	%IWr.m.c.38.11
SLAVE_ACTIV_61	BOOL	R	Slave operational on the bus: device 61	%IWr.m.c.38.12
SLAVE_ACTIV_62	BOOL	R	Slave operational on the bus: device 62	%IWr.m.c.38.13
SLAVE_ACTIV_63	BOOL	R	Slave operational on the bus: device 63	%IWr.m.c.38.14

Slave in Stop State

The table below shows the words %IWr.m.c.43 to %IWr.m.c.46:

Standard symbol	Type	Access	Description	Address
SLAVE_STOPPED_1_16	INT	R	Stopped slaves from 1 to 16	%IWr.m.c.43
SLAVE_STOPPED_17_32	INT	R	Stopped slaves from 17 to 32	%IWr.m.c.44
SLAVE_STOPPED_33_48	INT	R	Stopped slaves from 33 to 48	%IWr.m.c.45
SLAVE_STOPPED_49_63	INT	R	Stopped slaves from 49 to 63	%IWr.m.c.46

Pre-Operational Slaves

The table below shows the words %IWr.m.c.51 to %IWr.m.c.54:

Standard symbol	Type	Access	Description	Address
SLAVE_PREOP_1_16	INT	R	Pre-operational slaves from 1 to 16.	%IWr.m.c.51
SLAVE_PREOP_17_32	INT	R	Pre-operational slaves from 17 to 32.	%IWr.m.c.52
SLAVE_PREOP_33_48	INT	R	Pre-operational slaves from 33 to 48.	%IWr.m.c.53
SLAVE_PREOP_49_63	INT	R	Pre-operational slaves from 49 to 63.	%IWr.m.c.54

Master Cycle Time

The table below shows the meaning of status words relative to the time cycle of the master:

Addresses	Description	Meaning
%IWr.m.c.59	Minimum master cycle time	Minimum value of the CANopen master cycle time in ms.
%IWr.m.c.60	Current master cycle time	Current value of the CANopen master cycle time in ms.
%IWr.m.c.61	Maximum master cycle time	Maximum value of the CANopen master cycle time in ms.

The following symbols are accessible %IW.r.m.c.59 to %IW.r.m.c.61:

- INT_ERR_BIT -> Bit 0
- BUS_QUALITY_RESET_COUNTER -> Bit 3
- BUS_LOAD_RESET_COUNTER -> Bit 4

Bus Analysis Information

The table below shows the meaning of status words relative to Bus Analysis Information:

BUS_LOAD_MIN	INT	R	Minimum bus load in %	%IWr.m.c.62
BUS_LOAD_CURRENT	INT	R	Current busload in %	%IWr.m.c.63
BUS_LOAD_MAX	INT	R	Maximum busload in %	%IWr.m.c.64
BUS_QUALITY_NB_RX_FRAMES	DINT	R	Number of received frames	%IDr.m.c.66
BUS_QUALITY_NB_TX_FRAMES	DINT	R	Number of transmitted frames	%IDr.m.c.68
BUS_QUALITY_NB_CURRENT_ERROR_FRAMES	INT	R	Current number of error frames in % for last 10000 exchanged frames	%IWr.m.c.70
BUS_QUALITY_NB_MAX_ERROR_FRAMES	INT	R	Maximum number of error frames in %	%IWr.m.c.71
BUS_QUALITY_NB_MIN_ERROR_FRAMES	INT	R	Minimum number of error frames in %	%IWr.m.c.72
STATUS_NMT	INT	R	Return the status of NMT command	%IWr.m.c.73
STATUS_NMT_CMD	INT	R	Return the current NMT command and node number	%IWr.m.c.74
BUS_QUALITY_RESET_COUNTER	BOOL	W	Reset all the bus analysis informations	%QWr.m.c.0.3
BUS_LOAD_RESET_COUNTER	BOOL	W	Reset all the bus load informations	%QWr.m.c.0.4
CMD_NMT	INT	W	Send NMT commands	%QWr.m.c.1

Reset Emergency Default

The table below shows the meaning of the Reset Emergency Default objects:

Addresses	Description	Standard Symbol	Bit meaning
%QWr.m.c.0	Command word of the CANopen master	INT_ERR_BIT	**Bit 0 = 1:** Reset emergency slaves bit list. This bit is set to zero after the reset of the bit list.
			Bit 1 = 1: Reset bit 8 (overrun) in common status (%IW0.0.2.0). The bit 1 is set to zero after the reset of the bit 8.
			Bit 2 = 1: Reset bit 7 (change bit list) of event indicator (%IW0.0.2.2).The bit 2 is set to zero after the reset of the bit 7.
		BUS_QUALITY_RESET_COUNTER	**Bit 3 = 1:** Reset quality information: %ID0.y.2.66 to %IW0.y.2.72. This bit is set to zero after the reset of the words and the measure restarts.
		BUS_LOAD_RESET_COUNTER	**Bit 4 = 1:** Reset bus load information: %IW0.y.2.62 to %IW0.y.2.64. This bit is set to zero after the reset of the words and the measure restarts.
			Bit 5 = 1: Reset the CANopen master (useful to restart in Fatal Error without power down/up).The bit is set to zero after the reset of the master.
			Bit 6 to bit 15: Reserved
%QWr.m.c.1	NMT command		High byte: NMT command: • 81: reset node • 82: reset com • 80: pre-op • 01: start • 02: stop Low byte: node number: • 0: all nodes • 1..63: node number **NOTE:** After the command start, %QWr.m.c.1 is set to zero. **NOTE:** %IWr.m.c.73 and %IWr.m.c.74 are used to control the command processing (command state, return code and last NMT command).

Addresses	Description	Standard Symbol	Bit meaning
%IWr.m.c.73	Return the status of NMT command		High byte: command state: • 01: idle: a new command can be started if %QW0.r.m.c.1 is different from zero. • 02: waiting: the stack interface is used by another command, and the program is waiting until the command is finished. • 03: running: the command is started. • 04: ended: the command is finished. Low byte: return code of the command: • 0: command successfully executed • 1: bad command • 2: bad node number • 3: detected error during the command execution
%IWr.m.c.74	Return the current NMT command and node number		Last command executed: • High byte: NMT connected • Low byte: node number

Explicit Exchanges Objects of the IODDT

This part shows the explicit exchange language objects for the CANopen master.

These objects are exchanged on the application's request, using the instruction READ_STS.

The parameters r, m and c shown in the following tables represent the topological addressing of the module. Each parameter has the following signification:

- **r**: represents the rack number,
- **m**: represents the position of the module on the rack,
- **c**: represents the channel number.

Execution Indicator: EXCH_STS

The table below shows the meanings of channel exchange control bits from channel EXCH_STS (%MWr.m.c.0):

Symbol	Type	Access	Description	Number
STS_IN_PROGR	BOOL	R	Status parameter read in progress	%MWr.m.c.0.0

Exchange Report: EXCH_RPT

The table below presents the meaning of the run report bits of the channel EXCH_RPT (%MWr.m.c.1):

Symbol	Type	Access	Description	Number
STS_ERR	BOOL	R	Detected error while reading channel status	%MWr.m.c.1.0

Standard Channel Faults: CH_FLT

The following table explains the meaning of the CH_FLT (%MWr.m.c.2) status word bits. Reading is performed by a READ_STS:

Object	Function	Standard Symbol	Type	Access	Meaning
%MWr.m.c.2	Status of the CANopen Master	CAN_FLT	BOOL	R	**Bit 0 = 1:** The CANopen Master is not in operational state.
		FEW_SLAVE_FLT	BOOL	R	**Bit 1 = 1:** One or more slaves are not in an operational state.
		CAN_OFF	BOOL	R	**Bit 2:** Reserved.
		CONF_FLT	BOOL	R	**Bit 3 = 1:** Configuration detected error.
					Bit 4 to bit 7: Reserved. **Bit 8 to Bit 10:** CAN ERR led: • 000 = off • 001 = single flash • 010 = double flash • 011 = triple flash • 111 = on **Bit 11 to Bit 13:** CAN RUN led: • 001 = single flash • 100 = blinking • 111 = on **Bit 14 to Bit 15:** Reserved.
%MWr.m.c.3	Generic detected error count				Number of received emergency messages with code 10xxH
%MWr.m.c.4	Device hardware detected error count				Number of received emergency messages with code 50xxH
%MWr.m.c.5	Device software detected error count				Number of received emergency messages with code 60xxH
%MWr.m.c.6	Communication detected error count				Number of received emergency messages with code 81xxH
%MWr.m.c.7	Protocol detected error count				Number of received emergency messages with code 82xxH
%MWr.m.c.8	External detected error count				Number of received emergency messages with code 90xxH
%MWr.m.c.9	Device-specific				Number of received emergency messages with code FFxxH

Language Objects Associated with Configuration

At a Glance

The configuration of a CANopen master is stored in the configuration constants (%KW).

The parameters r,m and c shown in the following tables represent the topologic addressing of the module. Each parameter has the following signification:

- **r**: represents the rack number,
- **m**:represents the position of the module on the rack,
- **c**: represents the channel number.

Configuration Objects

The following table lists all process control language objects associated with the configuration of CANopen network:

Number	Type	Function	Description
%KWr.m.c.0	INT	Constant value used by the system	Least significant byte: Bit 2 to 7= 0, and : ● Bit 0= 0 and Bit 1= 0: reset of outputs if task in STOP or HALT ● Bit 0= 1 and Bit 1= 0: maintain of outputs if task in STOP or HALT ● Bit 0= 0 and Bit 1= 1: bus in STOP if task in STOP or HALT Most significant byte: 16#38.
%KWr.m.c.1	INT	Baud Rate *(see Premium and Atrium using Unity Pro, CANopen Field Bus, User manual)*	Values are encoded : ● 0 = 1000 Kbaud, ● 2 = 500 Kbaud, ● 3 = 250 Kbaud, ● 4 = 125 Kbaud, ● 5 = 50 Kbaud, ● 6 = 20 Kbaud.
%KWr.m.c.2	INT	COB-ID Synchronization	Default value: 0080h.
%KWr.m.c.3	INT	Synchronization period	1 .. 5000 ms.
%KWr.m.c.4	INT	Configuration bits	Size of input image zone TOR in the memory (in number of bits).
%KWr.m.c.5	INT	Configuration bits	Size of output image zone TOR in the memory (in number of bits).
%KWr.m.c.6	INT	Configuration bits	Address of the start of the input image zone TOR(%M).
%KWr.m.c.7	INT	Configuration bits	Address of the start of the output image zone TOR (%M).
%KWr.m.c.8	INT	Configuration words	Size of input image zone in the memory (in number of words).

Number	Type	Function	Description
%KWr.m.c.9	INT	Configuration words	Size of output image zone in the memory (in number of words).
%KWr.m.c.10	INT	Configuration words	Address of the start of the input image zone (%MW).
%KWr.m.c.11	INT	Configuration words	Address of the start of the input image zone (%MW).
%KWr.m.c.12	INT	NMT inhibit time	Minimum time in 1/10ms between 2 NMT commands on the bus. Default value= 50 (5 ms)
%KWr.m.c.13	INT	Device Bootup timeout	Timeout in ms for reading object 1000 during configuration of the devices. Default value= 50 ms
%KWr.m.c.14	INT	Device SDO timeout	SDO timeout in ms used for the device with node ID= 1 Default value= 1000 ms
%KWr.m.c.15	INT	Device SDO timeout	SDO timeout in ms used for the device with node ID= 2 Default value= 1000 ms
...	INT	...	SDO timeout in ms used for the device with node ID= ... Default value= 1000 ms
%KWr.m.c.76	INT	Device SDO timeout	SDO timeout in ms used for the device with node ID= 63 Default value= 1000 ms

9.3 Emergency objects

Emergency Objects

At a Glance

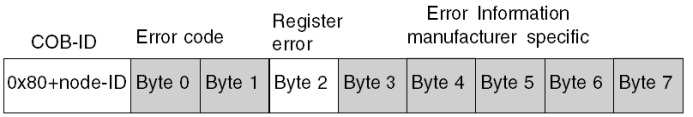
Emergency objects (EMCY) have been defined for CANopen for diagnostic applications.

The COB-ID of these objects contain the identity of the node of the device which produced the emergency message. The COB-ID of emergency objects are constructed in the following manner:

$$COB\text{-}ID_{EMCY} = 0x80 + \text{node identity}$$

The data field of an EMCY object is composed of 8 bytes containing:
- Emergency detected error code (2 bytes),
- The detected error register (1 byte),
- The factory-specific error information (5 bytes).

The following illustration shows the structure of an EMCY object:



NOTE: the contents of the detected error code and error register are specified by CiA.

With the `Error` tab (see *(see page 183)*), you can consult the 4 last emergency messages received, in chronological order.

NOTE: Regarding Safety considerations, “Emergency objects” and “Fatal error” are mentioned in this manual in conformance with the definition from the DS301 document of the CiA (CAN in Automation).

Detected error code 00xx

The following table describes the content of detected error code 00xx:

Detected error code (hex)	Description
00xx	Error reset to zero or no error

Detected error code 10xx

The following table describes the content of detected error code 10xx:

Detected error code (hex)	Description
10xx	Generic error

Detected error code 2xxx

The following table describes the content of detected error code 2xxx:

Detected error code (hex)	Description
20xx	Current
21xx	Current, input side of the device
22xx	Internal current to the device
23xx	Current, output side of the device

Detected error code 3xxx

The following table describes the content of detected error code 3xxx:

Detected error code (hex)	Description
30xx	Voltage
31xx	Principal voltage
32xx	Internal voltage to the device
33xx	Output voltage

Detected error code 4xxx

The following table describes the content of detected error code 4xxx:

detected error code (hex)	Description
40xx	Temperature
41xx	Ambient temperature
42xx	Device temperature

Detected error code 50xx

The following table describes the content of detected error code 50xx:

Detected error code (hex)	Description
50xx	Device hardware

Detected error code 6xxx

The following table describes the content of detected error code 6xxx:

Detected error code (hex)	Description
60xx	Device software
61xx	Internal software
62xx	User software
63xx	Data set

Detected error code 70xx

The following table describes the content of detected error code 70xx:

Detected error code (hex)	Description
70xx	Additional modules

Detected error code 8xxx

The following table describes the content of detected error code 8xxx:

Detected error code (hex)	Description
80xx	Monitoring
81xx	Communication
8110	CAN overflow (objects lost)
8120	CAN in passive error mode
8130	Life Guard error or Heartbeat error
8140	Recovered from bus
8150	Collision during COB-ID transmission
82xx	Protocol error
8210	PDO not processed due to length error
8220	PDO length exceeded

Detected error code 90xx

The following table describes the content of detected error code 90xx:

Detected error code (hex)	Description
90xx	External error

Detected error code Fxxx

The following table describes the content of detected error code Fxxx:

Detected error code (hex)	Description
F0xx	Additional functions
FFxx	Specific to the device

Quick start : example of CANopen implementation

III

Overview

This section presents an example of CANopen implementation.

What Is in This Part?

This part contains the following chapters:

Chapter	Chapter Name	Page
10	Description of the application	231
11	Installing the application using Unity Pro	233
12	Starting the Application	267

Description of the application

10

Overview of the application

At a glance

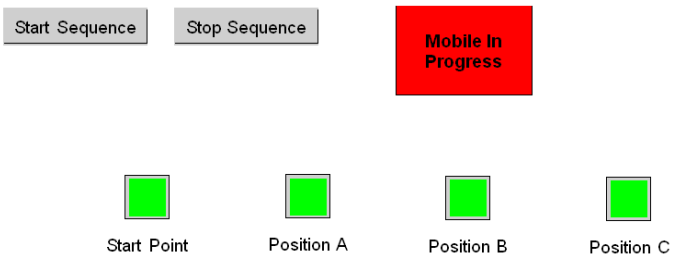
The application described in this document is used for the driving of a working mobile.

The mobile goes to different working positions following a defined position sequence. The mobile stops for few seconds at these positions.

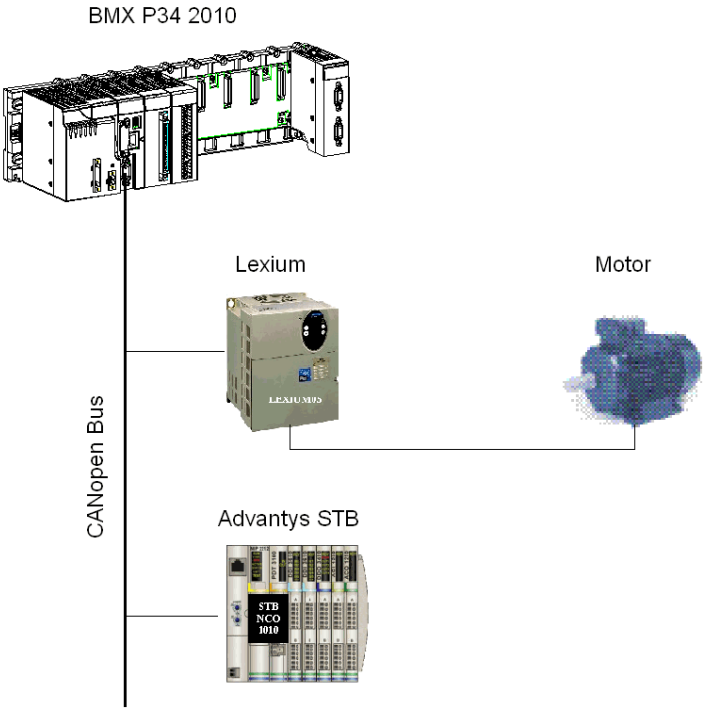
The application's control resources are based on an operator screen which shows the status of the various position sensors and the actual mobile position value. A red message blinks when the mobile is moving.

Illustration of the application

This is the application's final operator screen:



The equipments can be connected as follow:



Operating mode

The operating mode is as follows:

- A **Start Sequence** button is used to start the defined sequence.
- In this example, the mobile first goes to B position then to the A position and, at the end, to the C position, before coming back to the Start Point, waiting for a new start-up request.
- The mobile stops for few seconds at each position to simulate an action time.
- A **Stop Sequence** button interrupts the mobile sequence. The mobile stops to the last targeted position and comes back to the Start Point, waiting for a new start-up request.

Installing the application using Unity Pro

11

Subject of this chapter

This chapter describes the procedure for creating the application described. It shows, in general and in more detail, the steps in creating the different components of the application.

What Is in This Chapter?

This chapter contains the following sections:

Section	Topic	Page
11.1	Presentation of the solution used	234
11.2	Developping the application	237

11.1 Presentation of the solution used

Subject of this section

This section presents the solution used to develop the application. It explains the technological choices and gives the application's creation timeline.

What Is in This Section?

This section contains the following topics:

Topic	Page
Technological choices used	235
The different steps in the process using Unity Pro	236

Technological choices used

At a glance

There are several ways of writing a mobile driving application using Unity Pro. The one proposed, uses a Lexium 05 servo drives and Advantys STB island set up on a CANopen network.

Technological choices

The following table shows the technological choices used for the application:

Objects	Choices used
Lexium Operating Mode	Use of the Positioning Mode. This mode allows you to send a target position to the Lexium 05 servo drives through the CANopen network.
Sensor Interface	Use of a STB Advantys. This device is an assembly of distributed I/O, power, and other modules that function together as an island node on an open field bus network
Supervision screen	Use of elements from the library and new objects.
Main supervision program	This program is developed using a sequential function chart (SFC), also called GRAFCET. The various sections and transitions are created in Ladder Diagram (LD) language and in Structured Text language (ST).

NOTE: This example shows PDO and SDO exchange towards a speed drive. However, for speed drive configuration and control, the use of Motion Function Block is recommended.

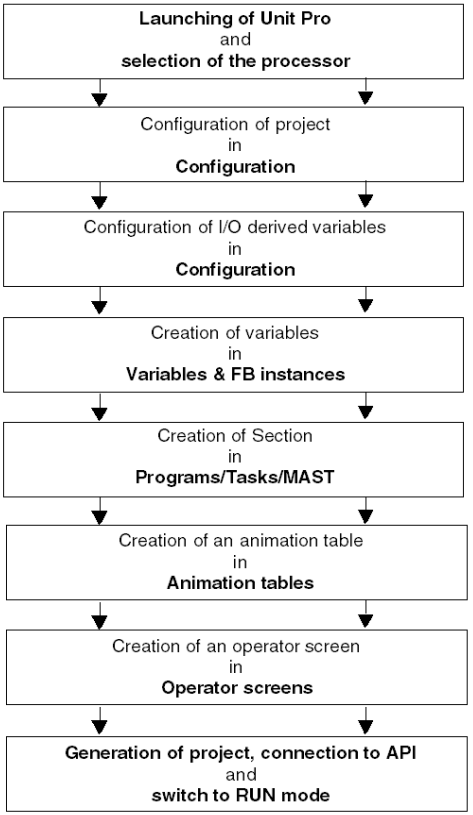
The different steps in the process using Unity Pro

At a glance

The following logic diagram shows the different steps to follow to create the application. A chronological order must be respected in order to correctly define all of the application elements.

Description

Description of the different types:



11.2 Developping the application

Subject of this section

This section gives a step-by-step description of how to create the application using Unity Pro.

What Is in This Section?

This section contains the following topics:

Topic	Page
Creating the project	238
Configuration of the CANopen Bus	239
Configuration of the CANopen Master	244
Configuration of the equipment	245
Declaration of variables	249
Creating the program in SFC for managing the move sequence	252
Creating a Program in LD for Application Execution	257
Creating a Program in LD for the operator screen animation	259
Creating a program in ST for the Lexium configuration	260
Creating an Animation Table	263
Creating the Operator Screen	265

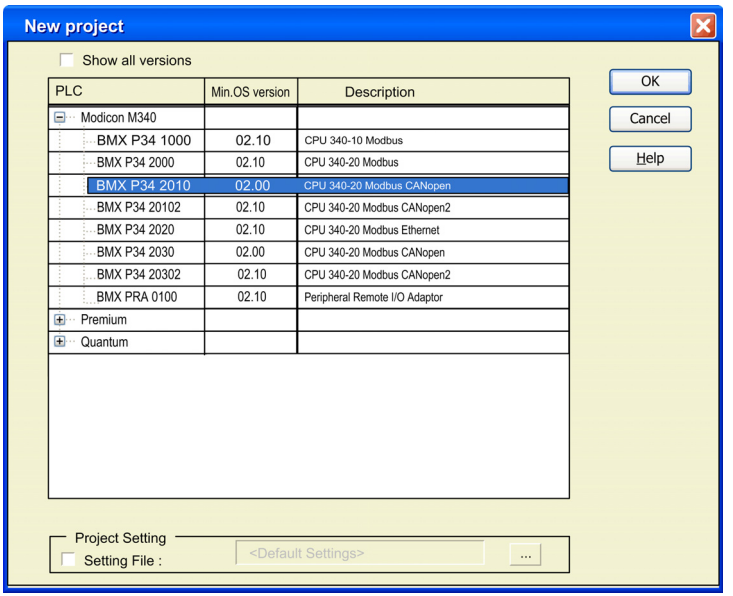
Creating the project

At a glance

Developing an application using Unity Pro involves creating a project associated with a PLC.

Procedure for creating a project

The table below shows the procedure for creating the project using Unity Pro.

Etape	Action
1	Launch the Unity Pro software.
2	Click on File then New to select a CANopen Master PLC (BMX P34 2010 for example): 
3	To see all PLC versions, click on the box Show all versions.
4	Select the processor you wish to use from those proposed.
5	To create a project with specific values of project settings, check the box **Settings File** and use the browser button to localize the .XSO file (Project Settings file). It is also possible to create a new one. If the **Settings File** box is not checked , default values of project settings are used.
6	Confirm with OK.

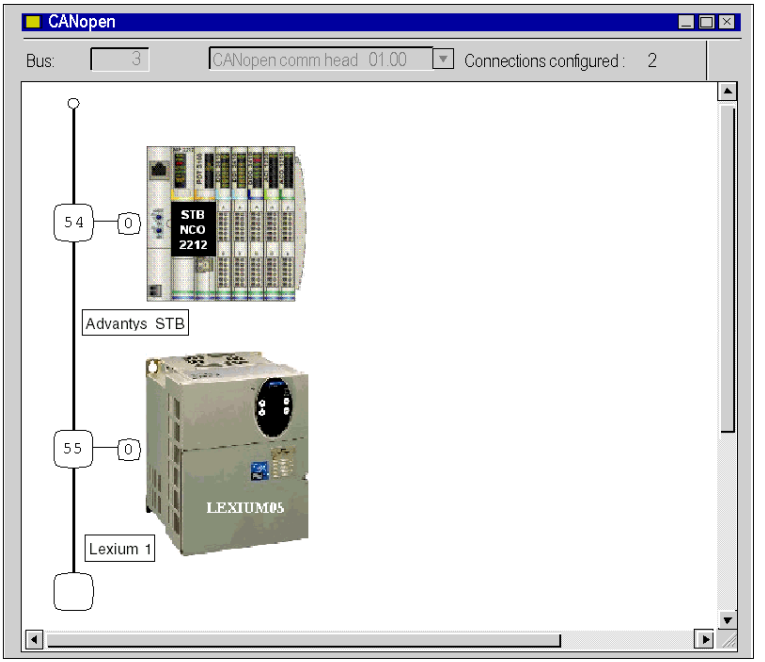
Configuration of the CANopen Bus

At a glance

Developing a CANopen application involves choosing the right slave devices and appropriate configuration.

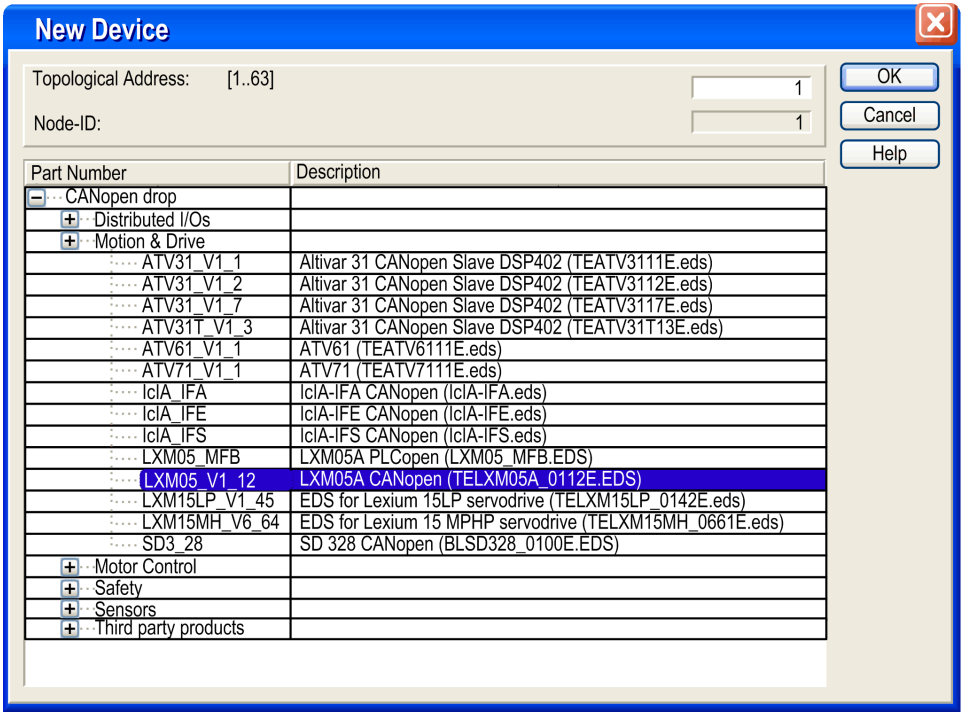
Illustration of the CANopen bus

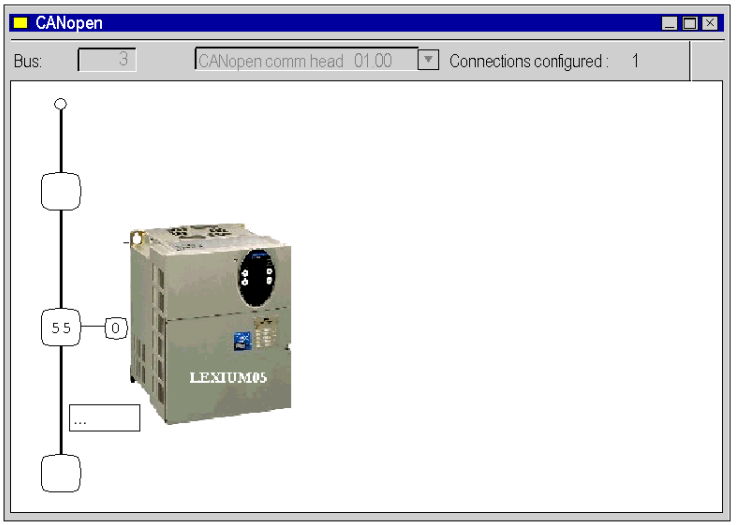
The following screen shows the configured CANopen bus:



CANopen bus Configuration

The table below shows the procedure for selecting the CANopen slaves:

Step	Action
1	In the `Project brower`, double-click on `Configuration` then on `3 : CANopen`. The `CANopen` window opens.
2	In the `CANopen` window, double-click on the node where the slave must be linked to. Result: the following window opens. 
3	In the `New Device` window, enter the node number (55), then double click on `Motion` and select the `Lexium05`.

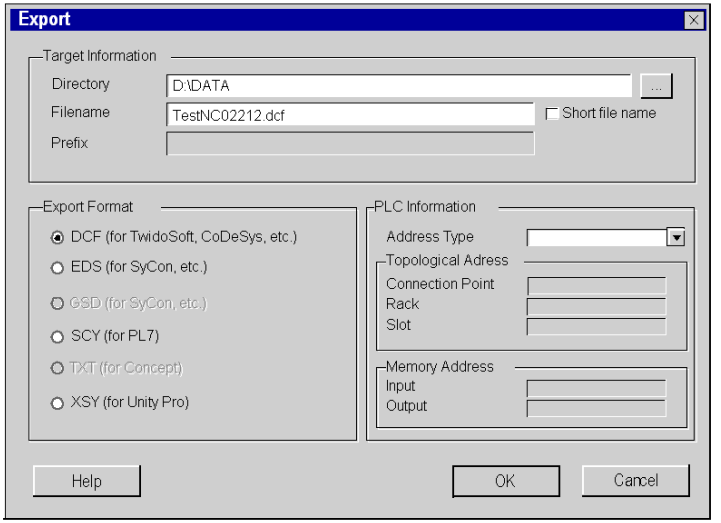
Step	Action
4	Confirm with OK. Result: the slave module is declared. 
5	Follow the same procedure to declare the Advantys STB island. In the `New Device` window, enter the node number (54), then double click on `Other` and select the `STB_NCO_2212`.

NOTE: This example shows PDO and SDO exchange towards a speed drive. However, for speed drive configuration and control, the use of Motion Function Block is recommended.

NOTE: This Advantys STB island configuration has to be set up using the Advantys Configuration Software.

STB island configuration

The table below shows the procedure to configure a STB island with Advantys Configuration Software:

Step	Action
1	Open Advantys Configuration Software Version 2.2.0.2 and create a new STB Island.
2	Insert a STB NCO2212 supply module, a STB DDI3420 discrete input module and a STB DD03410 discrete output module on the island.
3	Save the configuration and click on `File/Export` for exporting the island in DCF format. The `Export` window opens: 
4	Click on `OK`
5	Launch Unity Pro and open a project where an STB island will be used.
6	Add the STB equipment in the bus editor.
7	Right-click on the STB equipment then click on `Open the module`
8	In the `PDO` tab, click on the `Import DCF` button (see *Configuration of the STB, page 246*).
9	Click on OK to validate.

⚠ WARNING

UNINTENDED EQUIPMENT OPERATION

The symbol file ***.xsy** generated by Advantys must not be used in Unity Pro during the configuration of an STB Island.

CANopen devices are not supported during an ***.xsy** file import from Advantys to Unity Pro.

The %MW objects that are assigned in the PDO table are not in the same range as those defined in the configuration for the CAN open head.

Failure to follow these instructions can result in death, serious injury, or equipment damage.

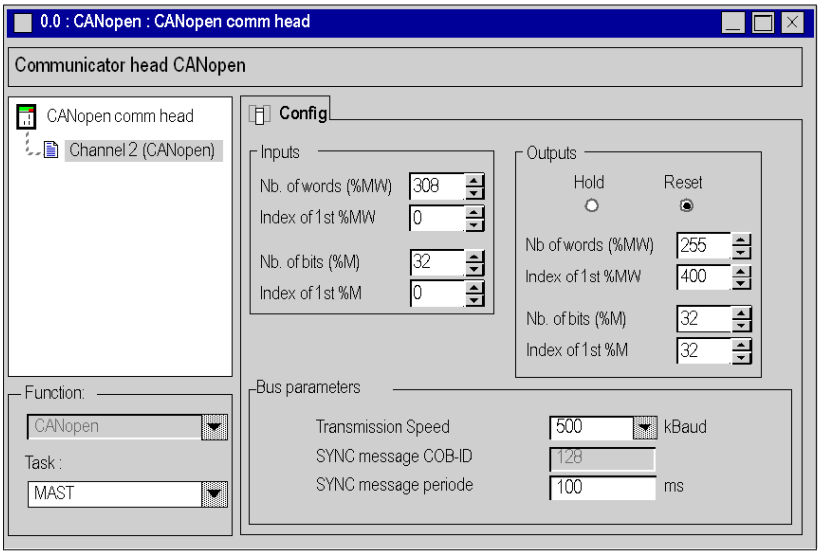
Configuration of the CANopen Master

At a glance

Developing a CANopen application involves choosing the right CANopen Master PLC configuration.

CANopen Master PLC configuration

The table below show the procedure for configuring the CANopen Master PLC:

Step	Action
1	In the `Project browser` double-click on `Configuration` then on `0:BMS XBP 0800` then on `0:BMX P34 2010`. double click on `CANopen` to access to the `CANopen Comm Head` window.
2	In the input and output configuration zones, enter the `index of the 1st word (%MW)` and the needed `number of words`.
3	In the `Bus Parameter` zone, select the application `transmission speed`. In this example, select 500 kBauds. 
4	Click on the button in the toolbarto validate the configuration.

NOTE: When the project is built, warning and error messages can be displayed in the output window. If not displayed, click on `View/Output Window`.

Warning messages indicates that there are more configured words than necessary on the bus.

Error messages indicate that configured words are missing.

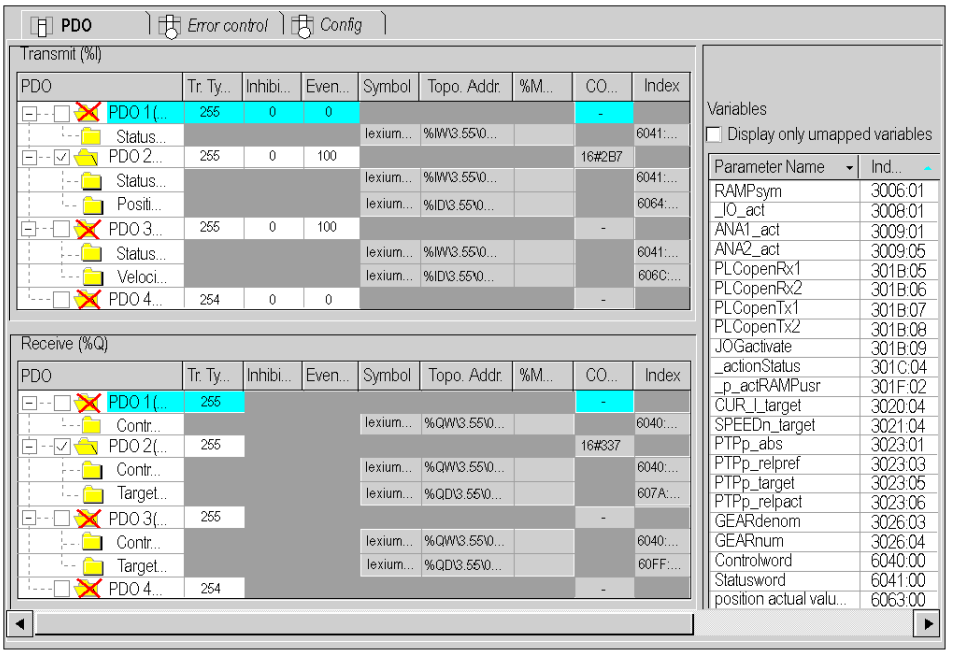
Configuration of the equipment

At a glance

Once the slave is declared, it's possible to have access to its configuration window.

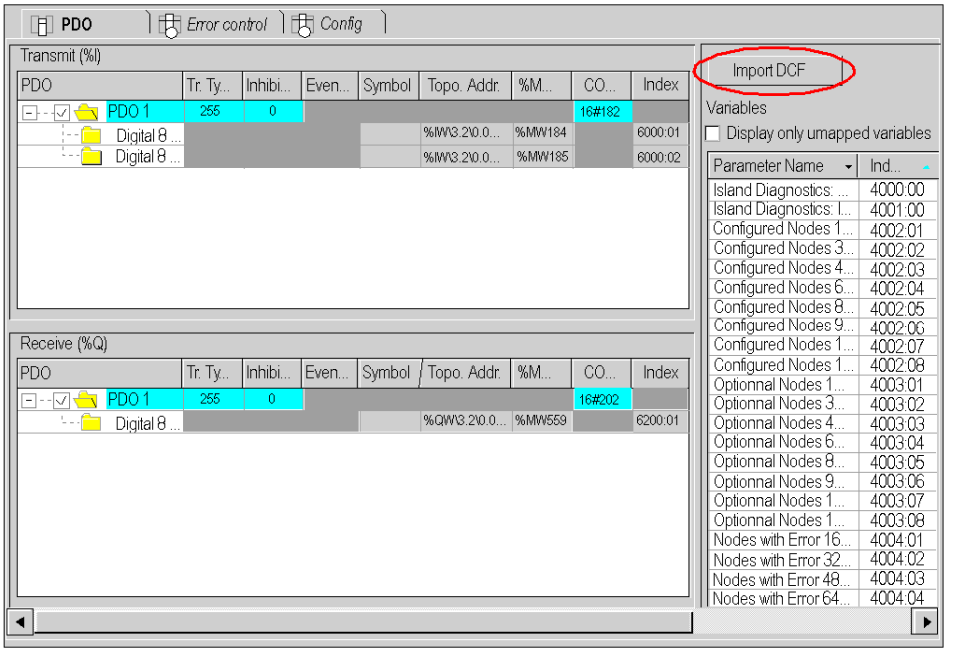
Configuration of the Lexium Servo Drives

The table below shows the procedure for the Lexium configuration:

Step	Action
1	In the `Project browser`, double-click on `Configuration` then `3: CANopen`.
2	In the `CANopen` window, double-click on the Lexium representation. The Lexium configuration window opens.
3	Click on the `PDO` tab to see the PDO configuration, the variables and their topological addresses.
4	For this example, select `PDO2(Static)` in the `Transmit (%I)` and the `Received (%Q)` windows. 
5	Click on the `Error control` tab and set the `Node Heartbeat producer time` to 300ms
6	Click on the button in the toolbar to validate the configuration.
7	Close the window.

Configuration of the STB

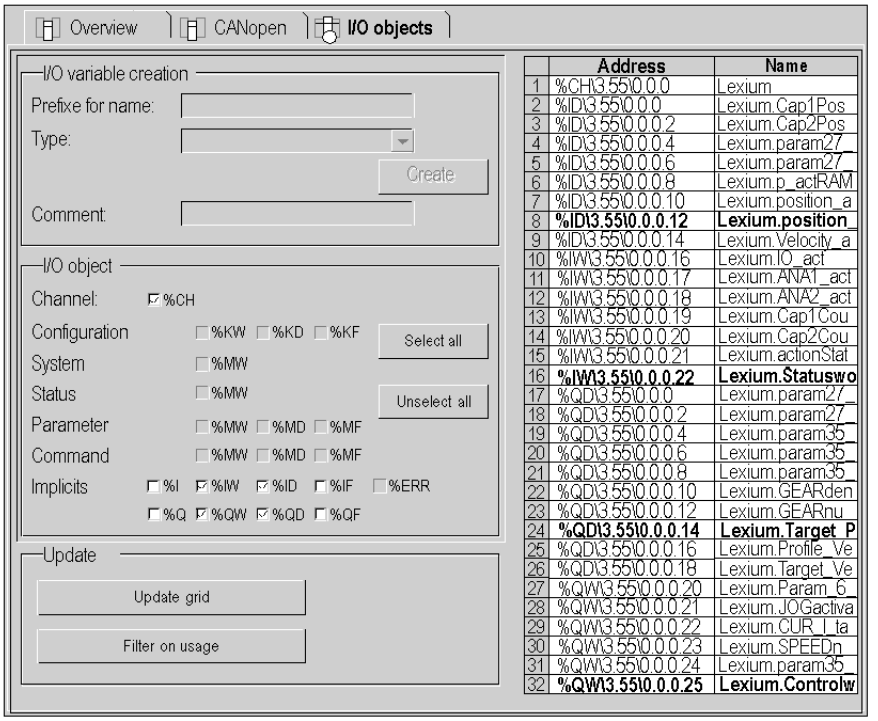
The table below shows the procedure to load the configuration defined with the Advantys Configuration software:

Step	Action
1	In the `Project browser`, double-click on `Configuration` then `3: CANopen`.
2	In the `CANopen` window, double-click on the Advantys STB representation. The STB NCO2212 configuration window opens.
3	In `Function` zone, select `Autoconf`. In this example, we use the `Autoconf` function because autoconfigurable modules are inserted on the STB island *(see page 272)*.
4	Click on the `PDO` tab to see the PDO configuration, the variables and their topological addresses. Click on the right button of the horizontal scroll bar to see the `Import DCF` button.
5	Click on `Import DCF` button to load the DCF configuration file generated with the Advantys Configuration Software. 

Step	Action
6	Click on the `Error control` tab and set the `Node Heartbeat producer time` to 300ms
7	Click on the button in the toolbar to validate the configuration.
8	Close the window. For more information refer to STB configuration *(see page 293)*.

Declaration of I/O objects

The table below shows the procedure to load the configuration defined with the Advantys Configuration software:

Step	Action
1	Open the `\3.55\0.0 : Lexium05` window by clicking on the Lexium module icon in the `CANopen` window. Click on the `Lexium05` and then on the `I/O object` tab.
2	Click on the I/O object prefix address `%CH` then on the `Update grid` button, the channel address appears in the I/O object grid.
3	Click on the line `%CH\3.55\0.0` and then, in the `I/O object creation` window, enter a channel name in the `prefix for name` zone, `Lexium` for example.
4	Now click on different Implicit I/O object prefix adresses then on `update grid` button to see the names and addresses of the homicide I/O objects. 

	Address	Name
1	%CH\3.55\0.0.0	Lexium
2	%ID\3.55\0.0.0	Lexium.Cap1Pos
3	%ID\3.55\0.0.2	Lexium.Cap2Pos
4	%ID\3.55\0.0.4	Lexium.param27_
5	%ID\3.55\0.0.6	Lexium.param27
6	%ID\3.55\0.0.8	Lexium.p_actRAM
7	%ID\3.55\0.0.10	Lexium.position_a
8	**%ID\3.55\0.0.12**	**Lexium.position_**
9	%ID\3.55\0.0.14	Lexium.Velocity_a
10	%IW\3.55\0.0.16	Lexium.IO_act
11	%IW\3.55\0.0.17	Lexium.ANA1_act
12	%IW\3.55\0.0.18	Lexium.ANA2_act
13	%IW\3.55\0.0.19	Lexium.Cap1Cou
14	%IW\3.55\0.0.20	Lexium.Cap2Cou
15	%IW\3.55\0.0.21	Lexium.actionStat
16	**%IW\3.55\0.0.22**	**Lexium.Statuswo**
17	%QD\3.55\0.0.0	Lexium.param27_
18	%QD\3.55\0.0.2	Lexium.param27_
19	%QD\3.55\0.0.4	Lexium.param35_
20	%QD\3.55\0.0.6	Lexium.param35_
21	%QD\3.55\0.0.8	Lexium.param35_
22	%QD\3.55\0.0.10	Lexium.GEARden
23	%QD\3.55\0.0.12	Lexium.GEARnu
24	**%QD\3.55\0.0.14**	**Lexium.Target_P**
25	%QD\3.55\0.0.16	Lexium.Profile_Ve
26	%QD\3.55\0.0.18	Lexium.Target_Ve
27	%QW\3.55\0.0.20	Lexium.Param_6_
28	%QW\3.55\0.0.21	Lexium.JOGactiva
29	%QW\3.55\0.0.22	Lexium.CUR_I_ta
30	%QW\3.55\0.0.23	Lexium.SPEEDn
31	%QW\3.55\0.0.24	Lexium.param35_
32	**%QW\3.55\0.0.25**	**Lexium.Controlw**

NOTE: Repeat the same procedure to create a CANopen I/O object named `BusMaster` (%CH0.0.2). In the `PLC bus` window, double-click on the `CANopen port` then click on `CANopen comm head` to access the `I/O objects` tab.

Declaration of variables

At a glance

All of the variables used in the different sections of the program must be declared.

Undeclared variables cannot be used in the program.

NOTE: For more information, see Unity Pro online help (click on ?, then `Unity`, then `Unity Pro`, then `Operate modes`, and `Data editor`).

Procedure for declaring variables

The table below shows the procedure for declaring application variables:

Step	Action
1	In `Project browser / Variables & FB instances`, double-click on `Elementary variables`
2	In the `Data editor` window, select the box in the Name column and enter a name for your first variable.
3	Now select a Type for this variable.
4	When all your variables are declared, you can close the window.

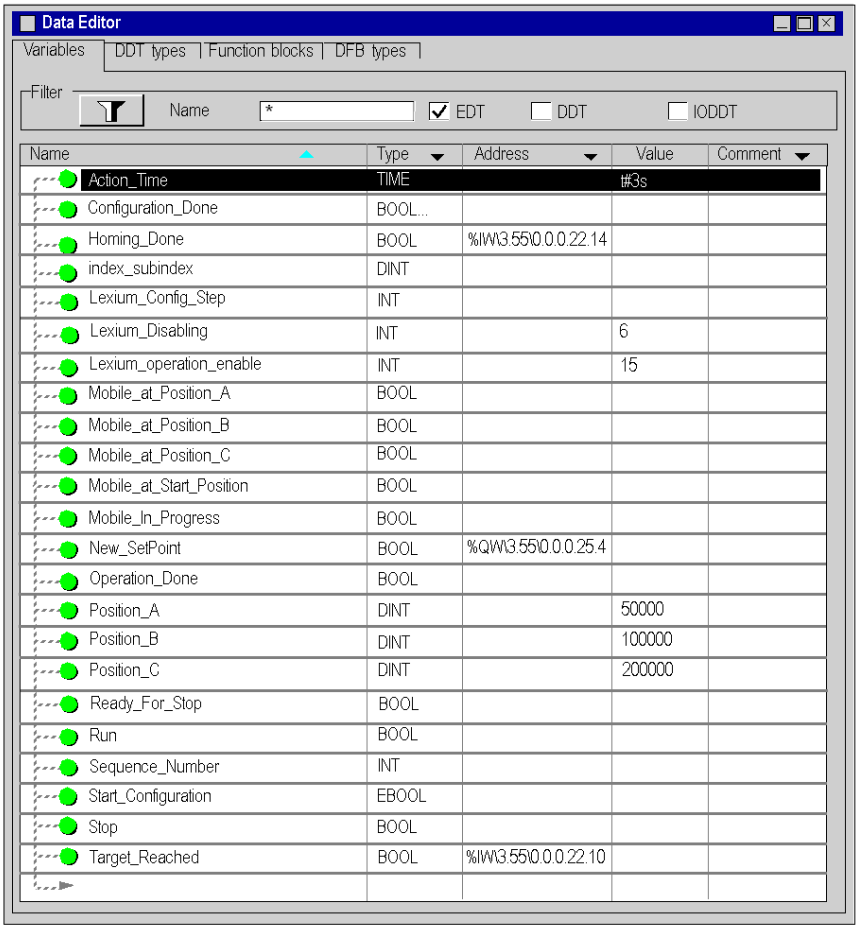
Variables used for the application

The following table shows the details of the variables used in the application:

Variable	Type	Definition
Action_Time	TIME	Mobile stopping time at each position.
Configuration_Done	BOOL	The Lexium configuration is done.
Homing_Done	BOOL	The definition of the origin point is done.
index_subindex	DINT	CANopen parameter addresses for the WRITE_VAR block.
Lexium_Config_Step	INT	Configuration steps (program)
Lexium_Disabling	INT	Shutdown command
Lexium_operation_enable	INT	Command to start the Lexium drive.
Mobile _at_Position_A	BOOL	Mobile at the A position.
Mobile _at_Position_B	BOOL	Mobile at the B position.
Mobile _at_Position_C	BOOL	Mobile at the C position.
Mobile_at_start_position	BOOL	Mobile at the start position.
Mobile_in_Progress	BOOL	The mobile is moving.
New_SetPoint	BOOL	Start the next move.
Operation_done	BOOL	The mobile operation is done.

Variable	Type	Definition
Position_A	DINT	First positioning value.
Position_B	DINT	Second positioning value.
Position_C	DINT	Third positioning value.
Ready_For_Stop	BOOL	The mobile goes to the last targeted position indicated before stopping the application. Then it comes back to the start position.
Run	BOOL	Start of the sequence.
Sequence_Number	INT	Number of displacements made by the mobile.
Start_Configuration	EBOOL	Start the Lexium configuration.
Stop	BOOL	The mobile stops the sequence and comes back to the start point.
Target_Reached	BOOL	The target position is reached.

The following screen shows the application variables created using the data editor :



Name	Type	Address	Value	Comment
Action_Time	TIME		t#3s	
Configuration_Done	BOOL...			
Homing_Done	BOOL	%IW\3.55\0.0.0.22.14		
index_subindex	DINT			
Lexium_Config_Step	INT			
Lexium_Disabling	INT		6	
Lexium_operation_enable	INT		15	
Mobile_at_Position_A	BOOL			
Mobile_at_Position_B	BOOL			
Mobile_at_Position_C	BOOL			
Mobile_at_Start_Position	BOOL			
Mobile_In_Progress	BOOL			
New_SetPoint	BOOL	%QW\3.55\0.0.0.25.4		
Operation_Done	BOOL			
Position_A	DINT		50000	
Position_B	DINT		100000	
Position_C	DINT		200000	
Ready_For_Stop	BOOL			
Run	BOOL			
Sequence_Number	INT			
Start_Configuration	EBOOL			
Stop	BOOL			
Target_Reached	BOOL	%IW\3.55\0.0.0.22.10		

NOTE: At start-up, the Lexium 05 is in `Ready to switch on` state (`rdy` is displayed). To be able to drive the motor, the Lexium must be in `Operation enable` state. To switch in this state, a bus command sets the 4 last bits of the Lexium control word to ‘1’ (00001111 (binary) = 15 (decimal)).

To switch the Lexium 05 to the `Ready to switch on` state, a bus command sets the sixth and the seventh bit of the Lexium control word to ‘1’ (00000110 (binary) = 6 (decimal)).

For more information on Lexium control word, consult the Lexium manufacturer manual.

Creating the program in SFC for managing the move sequence

At a glance

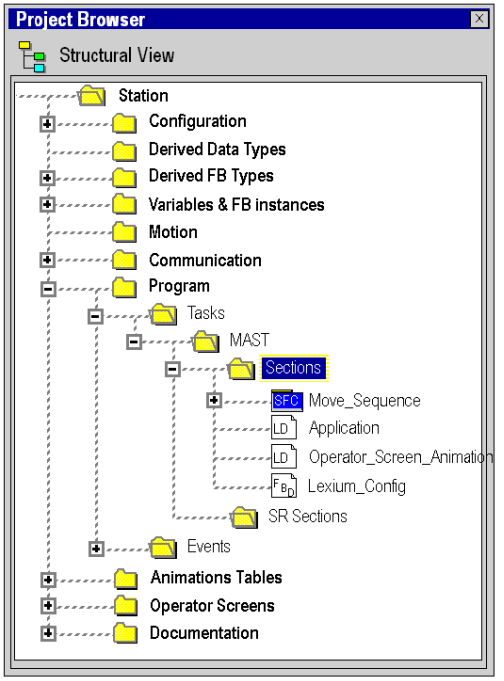
The main program is written in SFC (Grafcet). The different sections of the grafcet steps and transitions are written in LD. This program is declared in a MAST task, and will depend on the status of a Boolean variable.

The main advantage of SFC language is that its graphic animation allows us to monitor in real time the execution of an application.

Several sections are declared in the MAST task:

- The **Move_Sequence** (See *Illustration of the Move_Sequence section, page 255*) section, written in SFC and describing the operate mode.
- The **Application** (See *Creating a Program in LD for Application Execution, page 257*) section, written in LD, which executes the mobile action delay time and resets the positioning start bit `New_Setpoint`.
- The **Operator_Screen_Animation** (See *Creating a Program in LD for the operator screen animation, page 259*) section, written in LD which is used to animate the operator screen.
- The **Lexium_Config** (See *Creating a program in ST for the Lexium configuration, page 260*) section, written in ST and describing the different steps of the Lexium configuration.

In the project browser, the sections are represented as follow:



NOTE: The LD, SFC and FBD-type sections used in the application must be animated in online mode (See *Execution of Application in Standard Mode, page 267*), with the PLC in RUN

NOTE: If task cycle is faster than CANopen Master cycle, outputs can be overwritten. To avoid that, it is recommended to have a task cycle higher than the CANopen Master cycle.

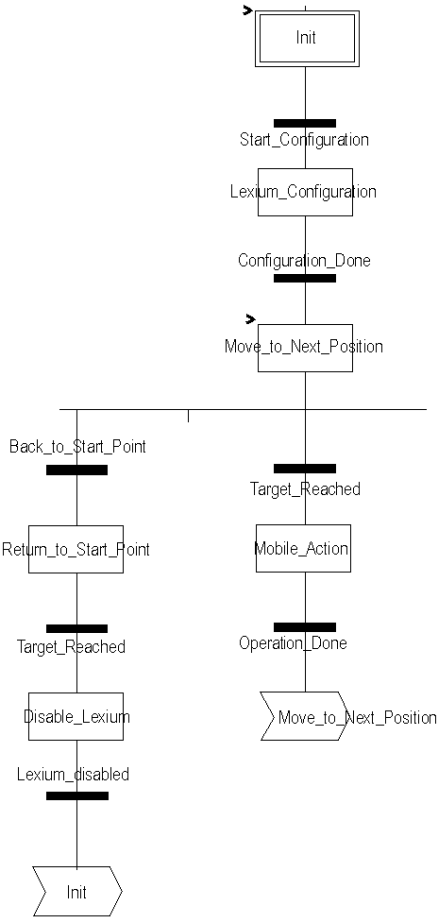
Procedure for Creating an SFC Section

The table below shows the procedure for creating an SFC section for the application.

Step	Action
1	In `Project Browser\Program\Tasks`, double-click on `MAST`.
2	Right click on `Section` then select `New section`. Give your section a name (Movement_sequence for the SFC section) then select SFC language.
3	The name of your section appears, and can now be edited by double clicking on it.
4	The SFC edit tools appear in the window, which you can use to create your Grafcet. For example, to create a step with a transition: • To create the step, click on then place it in the editor, • To create the transition, click on then place it in the editor (generally under the preceding step).

Illustration of the Move_Sequence section

The following screen shows the application Grafcet. There is no condition defined:



For actions and transitions used in the grafcet, see *Actions and transitions, page 297*

NOTE: For more information on creating an SFC section, see Unity Pro online help (click on ?, then `Unity`, then `Unity Pro`, then `Operate modes`, then `Programming` and `SFC editor`

Description of the Move_Sequence Section

The following table describes the different steps and transitions of the Move_Sequence Grafcet:

Step / Transition	Description
Init	This is the initial state.
Start_Configuration	This transition is active when the variables: ● Stop = 0, ● Run = 1.
Lexium_Configuration	The Lexium 05 is enabled and the 0 position is defined (using the Lexium's Homing function).
Configuration_done	The transition is active when the Lexium is initialized.
Move_to_next_position	The next target position is loaded in the Lexium 05. When this step is activated, the sequence number is incremented.
Target_reached	This variable is set to '1' by the Lexium 5 when the target position is reached.
Mobile_action	The mobile is at the target position and is operating an action.
Operation_done	This transition is active when the mobile operation is over.
Back_to_start_point	This transition is active when the sequence is over or when a stop request is ordered.
Return_to_start_point	The start point is defined at the target position.
Disable_Lexium	The Lexium 05 drive is disabled.
Lexium_disabled	This transition is valid when the Lexium is disabled.

NOTE: You can see all the steps and actions and transitions of your SFC by clicking on in front of the name of your SFC section.

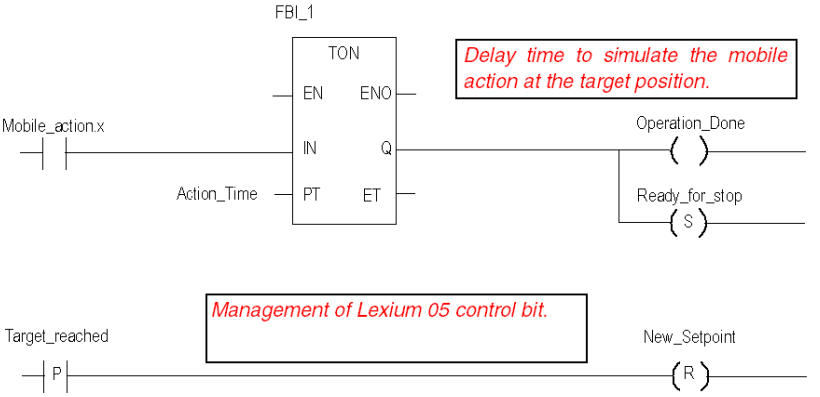
Creating a Program in LD for Application Execution

At a glance

This section executes the mobile action delay time and resets the positioning start bit `New_Setpoint`.

Illustration of the Application Section

The section below is part of the MAST task. It has no condition defined for it so is permanently executed:



Description of the Application Section

- The first line is used to simulate the action time once the mobile is at the target position. When the `Mobile_Action` step is active, a TON timer is triggered. When the PT time is reached, the TON output switches to ‘1’, validate the transition variable `Operation_done` and set the `Ready_for_stop` variable.
- The second line resets the variable `New_Setpoint` on the `Target_reached` positive transition.

Procedure for Creating an LD Section

The table below describes the procedure for creating part of the **Application** section.

Step	Action
1	In `Project Browser\Program\Tasks`, double-click on `MAST`.
2	Right click on `Section` then select `New section`. Name this section Application, then select the language type LD. The edit window opens.
3	To create the contact Action_Mobile.x, click on then place it in the editor. Double-click on this contact then enter the name of the step with the suffix ".x" at the end (signifying a step of an SFC section). Confirm with OK.
4	To use the TON block you must instantiate it. Right click in the editor then click on `Data Selection` and on . Click on the `Function and Function Block Types` tab. Click on `Libset`, select the TON block in the list then confirm with OK and position your block. To link the Action_Mobile.x contact to the Input of the TON function block, align the contact and the input horizontally, click on and position the link between the contact and the input.

NOTE: For more information on creating an LD section, see Unity Pro online help (click on ?, then `Unity`, then `Unity Pro`, then `Operate modes`, then `Programming` and `LD editor`).

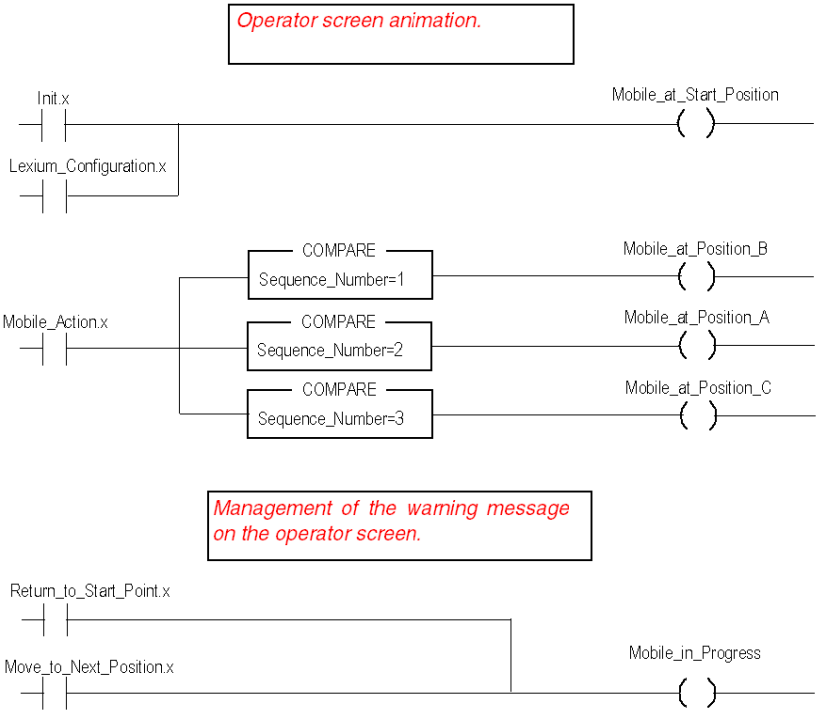
Creating a Program in LD for the operator screen animation

At a glance

This section animates the operator screen.

Illustration of the Operator_Screen_Animation section

The section below is part of the MAST task. It has no condition defined for it so is permanently executed:



Procedure for Creating an LD Section

For creating a LD section, see *Procedure for Creating an LD Section, page 258*

Creating a program in ST for the Lexium configuration

At a glance

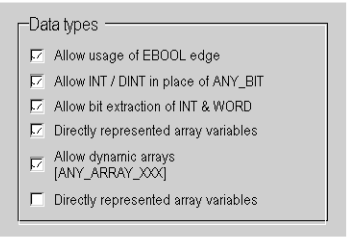
This section executes the different steps of the Lexium configuration. This section is only active when the step `Lexium_Configuration` is reached in the grafcet (see *Illustration of the Move_Sequence section, page 255*)

Programming structure

The programming structure is as follow:

Step number	Step description
0	Starting command of the Lexium.
10	If the Lexium is in **Run** State, then it switch in **Homing** mode using a WRITE_VAR function.
20	If the result of WRITE_VAR is conclusive then go to step 30.
30	**Homing** method definition using a WRITE_VAR function. For more information about the reference movement method, please refer to the Lexium user manual).
40	If the result of WRITE_VAR is conclusive then go to step 50.
50	Starting of the **Homing** method.
60	The Homing is done.
70	The Lexium switches in **Positionning** Mode using a WRITE_VAR function.
80	If the result of WRITE_VAR is conclusive then the Lexium configuration is done.

NOTE: For a correct variable declaration, click on **Tools/Project Settings/Language extension** then check "Directly represented array variables" and "Allow dynamic arrays".


Data types
Allow usage of EBOOL edge
Allow INT / DINT in place of ANY_BIT
Allow bit extraction of INT & WORD
Directly represented array variables
Allow dynamic arrays [ANY_ARRAY_XXX]
Directly represented array variables

ST Program

The example is programmed in ST structured litteral language. The dedicated section is under the same master task (MAST).

```
CASE Lexium_Config_Step OF
0: (* Lexium is in "Ready to switch on" position *)
 IF (Lexium.statusword.0) THEN
  Lexium.controlword:=Lexium_operation_enable;
  Lexium_Config_Step := 10;
 END_IF;
10: (* Lexium is in "Run" position *)
 IF (Lexium.statusword.2) THEN (* Operating mode: Homing *)
  index_subindex:=16#00006060 (*CANopen parameter address*)
  %MW200:=6; (*Definition of the Lexium Function: Homing*)
  %MW162:=5; (*Time out 500ms*)
  %MW163:=1; (*Length 1 byte*)
 WRITE_VAR(ADDM('0.0.2.55'),'SDO',index_subindex,0,%MW200:1,
%MW160:4);
   Lexium_Config_Step:=20;
 END_IF;

20: (* Test WRITE_VAR function result *)
 IF (NOT %MW160.0) THEN (* test activity bit*)
   IF (%MW161=0) THEN (* correct exchange*)
     Lexium_Config_Step := 30;
   END_IF;
 END_IF;

30: (* Homing method: set dimensions *)
 index_subindex:=16#00006098
 %MW150:=35; (*Definition of Homing method*)
 %MW252:=5; (*Time out 500ms*)
 %MW253:=1; (*Length 1 byte*)
 WRITE_VAR(ADDM('0.0.2.55'),'SDO',index_subindex,0,%MW150:1,
%MW250:4);
```

```
 Lexium_Config_Step:=40;

40: (* Test WRITE_VAR function result *)
 IF (NOT %MW250.0) THEN (* test activity bit*)
   IF (%MW251=0) THEN (* correct exchange*)
     New_Setpoint:=0;
     Lexium_Config_Step := 50;
   END_IF;
 END_IF;

50: (* Trigger homing *)
 New_Setpoint :=1;
 Lexium_Config_Step:=60;

60: (* Homing done *)
 IF (Target_Reached) AND (Homing_Done) THEN
  New_Setpoint:=0;
  Lexium_Config_Step:=70;
 END_IF;
70: (* Operating mode: Positionnig *)
 index_subindex:=16#00006060
 %MW450:=1; (*Definition of Positionning method*)
 %MW352:=5; (*Time out 500ms*)
 %MW353:=1; (*Length 1 byte*)
 WRITE_VAR(ADDM('0.0.2.55'),'SDO',index_subindex,0,%MW450:1,
%MW350:4);
 Lexium_Config_Step:=80;
80: (* Test WRITE_VAR function result *)
 IF (NOT %MW350.0) THEN (* test activity bit*)
   IF (%MW351=0) THEN (* correct exchange*)
     Configuration_Done := 1;
   END_IF;
 END_IF;
END_CASE;
```

Creating an Animation Table

At a glance

An animation table is used to monitor the values of variables, and modify and/or force these values. Only those variables declared in `Variables & FB instances` can be added to the animation table

NOTE: Note: For more information, consult the Unity Pro online help (click ?, then `Unity`, then `Unity Pro`, then `Operate modes`, then `Debugging and adjustment` then `Viewing and adjusting variables` and `Animation tables`).

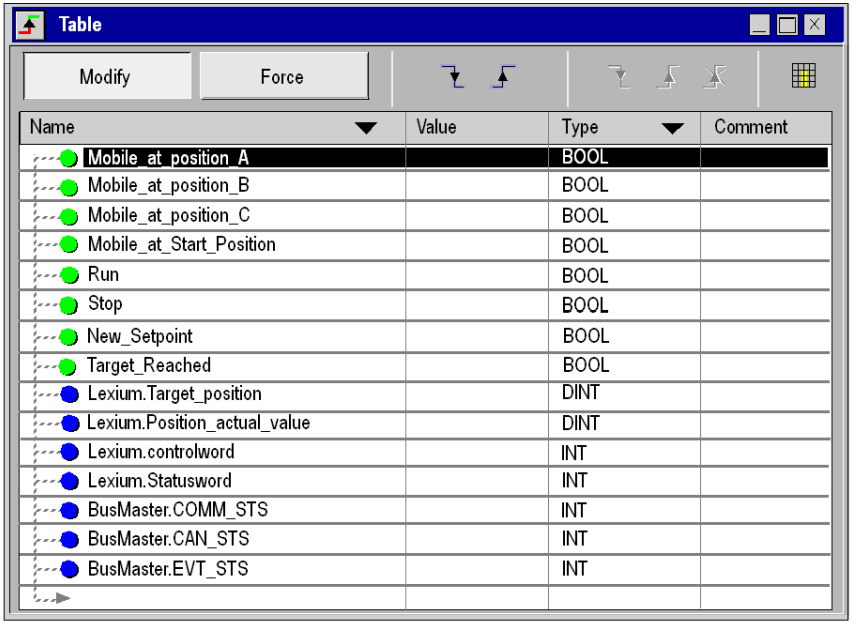
Procedure for Creating an Animation Table

The table below shows the procedure for creating an animation table.

Step	Action
1	In the `Project browser`, right click on `Animation tables` then click on `New Animation Table`. The edit window opens.
2	Click on first cell in the Name column, then on the button, and add the variables you require.

Animation Table Created for the Application

The following screen shows the animation table used by the application:



For more information about the creation of the Lexium and the BusMaster objects, see *Declaration of I/O objects, page 248*

NOTE: The animation table is dynamic only in online mode (display of variable values)

NOTE: COMM_STS, CAN_STS and EVT_STS words are used to check the application good operating. For more information, consult the CANopen user manual.

NOTE: To fill the animation table quickly, select several variables by maintaining the `Control` button.

Creating the Operator Screen

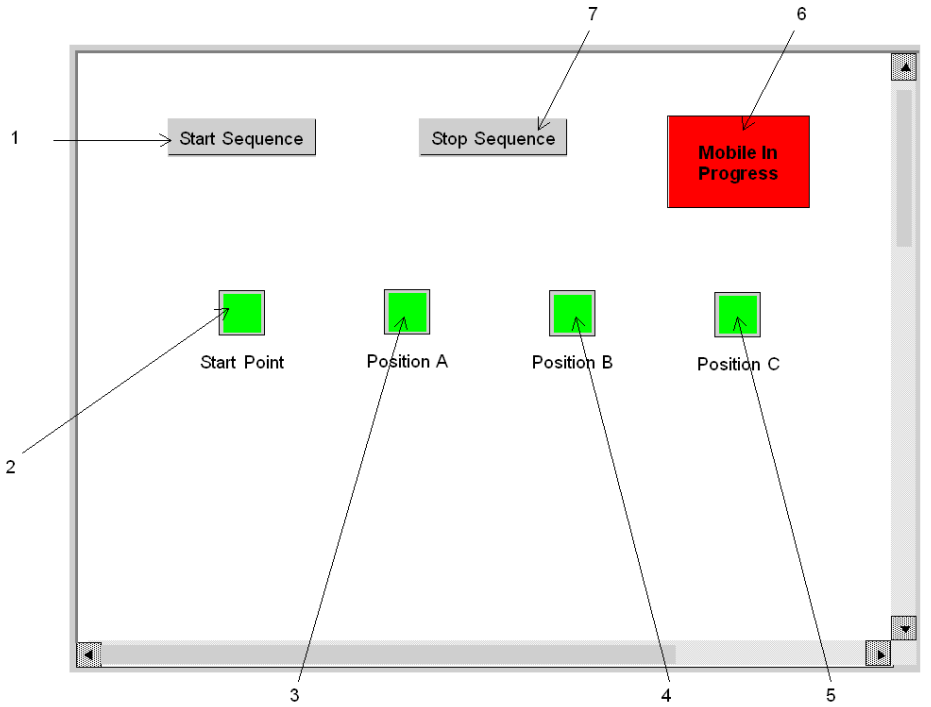
At a glance

The operator screen is used to animate graphic objects that symbolize the application. These objects can belong to the Unity Pro library, or can be created using the graphic editor.

NOTE: For more information, see Unity Pro online help (click on ?, then `Unity`, then `Unity Pro`, then `Operate modes`, and `Operator screens)`.

Illustration of the Operator Screen

The following illustration shows the application operator screen:



The associated variables are presented in the table below:

N°	Description	Associated variable
1	Start button	Run
2	Start point light indicator	Mobile_At_Start_Position
3	"Position" A light indicator	Mobile_At_Position_A
4	"Position B" light indicator	Mobile_At_Position_B
5	"Position C" light indicator	Mobile_At_Position_C
6	"Mobile in progress" light indicator	Mobile_in_Progress
7	Stop button	Stop

NOTE: To animate objects in online mode, you must click on . By clicking on this button, you can validate what is written.

Procedure for Creating an Operator Screen

The table below shows the procedure for creating the Start button.

Step	Action
1	In the `Project browser`, right click on `Operator screens` and click on `New screen`. The operator screen editor appears.
2	Click on the and position the new button on the operator screen. Double click on the button and in the `Control` tab, select the Run variable by clicking the button and confirm with OK. Then, enter the button name in the text zone.

The table below shows the procedure for inserting and animating indicator light.

Step	Action
1	In the Tools menu, select `Operator screens Library`. Double click on `Display unit` then `Indicator light`. Select the dynamic green light from the runtime screen and Copy (Ctrl+C) then Paste (Ctrl+V) it into the drawing in the operator screen editor.
2	The light is now in your operator screen. Select your light then click on . Press enter and the object properties window opens. Select the `Animation` tab and enter the concerned variable, by clicking on (in the place of %MW1.0). Click on and enter the same variable.
3	Confirm with apply and OK.

Starting the Application

12

Execution of Application in Standard Mode

At a glance

To work in standard mode, you need to associate defined variables to PDO addresses of the equipment declared on CANopen Bus.

NOTE: For more information on addressing, see Unity Pro online help (click on ?, then `Unity`, then `Unity Pro`, then `Languages reference`, then `Data description` and `Data instances`

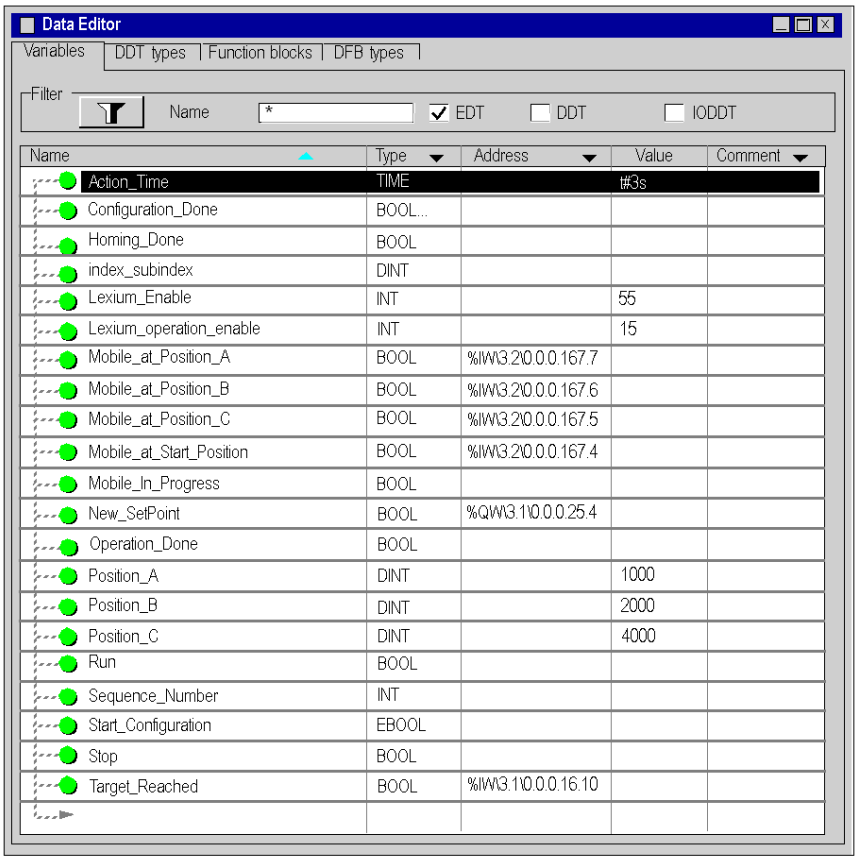
Assignment of variables

The table below shows the procedure for direct addressing of variables:

Step	Action
1	In the `Project browser` and in Variables & FB instances, double-click on `Elementary variables`.
2	In the Address column, enter the address associated with the variable in the form \Bus.Node\Rack.Module.Channel.Data.
3	Repeat the same procedure for all located variables.

Illustration of assigned variables

The following screen shows the application variables assignment:



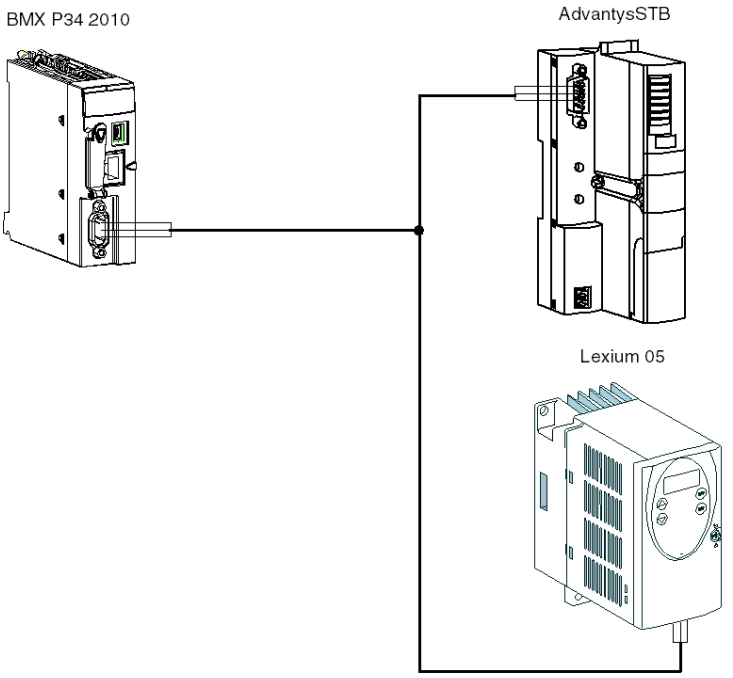
Name	Type	Address	Value	Comment
Action_Time	TIME		#3s	
Configuration_Done	BOOL			
Homing_Done	BOOL			
index_subindex	DINT			
Lexium_Enable	INT		55	
Lexium_operation_enable	INT		15	
Mobile_at_Position_A	BOOL	%IW\3.2\0.0.0.167.7		
Mobile_at_Position_B	BOOL	%IW\3.2\0.0.0.167.6		
Mobile_at_Position_C	BOOL	%IW\3.2\0.0.0.167.5		
Mobile_at_Start_Position	BOOL	%IW\3.2\0.0.0.167.4		
Mobile_In_Progress	BOOL			
New_SetPoint	BOOL	%QW\3.1\0.0.0.25.4		
Operation_Done	BOOL			
Position_A	DINT		1000	
Position_B	DINT		2000	
Position_C	DINT		4000	
Run	BOOL			
Sequence_Number	INT			
Start_Configuration	EBOOL			
Stop	BOOL			
Target_Reached	BOOL	%IW\3.1\0.0.0.16.10		

Description of variables assignment.

- The first four Boolean variables are assigned to the four discrete inputs of the STB DDI 3420 module.
- `New_Setpoint` is assigned to the Lexium 05 control bit. A positive transition of this bit triggers a new positioning.
- `Target_Reached` is assigned to the Lexium 05 status bit which is set to ‘1’ when the target is reached.

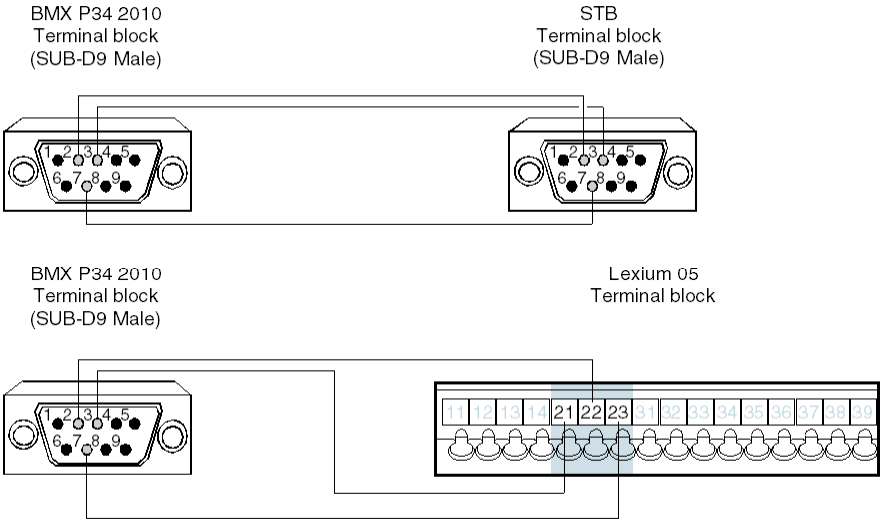
CANopen bus wiring

The CANopen bus is connected as follow:



NOTE: The Lexium 05 is at the end of the CANopen Bus. Set the `Terminating resistor CAN` switch to '1'.

The assignment of the pins connectors is as follow:



BMX P34 2010/20102 terminal block description:

Pin number	Symbol	Description
1	-	Reserved
2	CAN_L	CAN_L bus line (Low)
3	CAN_GND	CAN ground
4	-	Reserved
5	Reserved	Optional CAN protection
6	(GND)	Optional ground
7	CAN_H	CAN_H bus line (High)
8	-	Reserved
9	Reserved	CAN external positive supply (optionnal)

STB terminal block description:

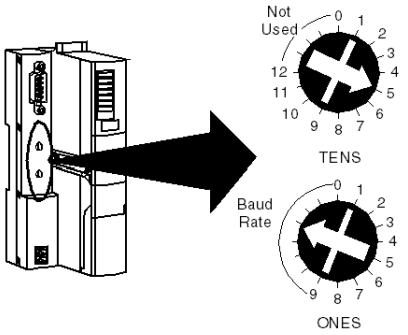
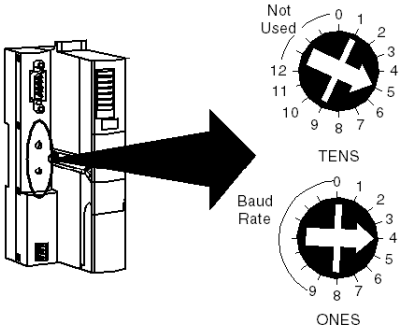
Pin number	Symbol	Description
1	-	Reserved
2	CAN_L	CAN_L bus line (Low)
3	CAN_GND	CAN ground
4	-	Reserved
5	(CAN_SHLD)	Optional CAN protection
6	(GND)	Optional ground
7	CAN_H	CAN_H bus line (High)
8	-	Reserved
9	-	Reserved

Lexium 05 terminal block description:

Pin number	Symbol	Description
21	CAN_GND	CAN ground
22	CAN_L	CAN_L bus line (Low)
23	CAN_H	CAN_H bus line (High)

Advantys STB configuration

The table below shows the procedure for configuring the Lexium 05:

Step	Action
1	Shut down the STB.
2	Using the rotary switches (located on the front of the CANopen NIM), configure the baud rate. The rotary switches are positionned as followed (5 = 500 kbits/s): 
3	Start up then shut down the STB.
4	Using the rotary switches, configure the address of the STB. For example, is the node number of the equiment is ‘54’, the rotary switches are positionned as followed: 
5	Start up the STB and press the reset button located on the STB NCO module during for 5 seconds.
6	The STB is configured automatically.

Lexium configuration

The table below shows the procedure for configuring the Lexium 05:

Step	Action
1	Start up the Lexium 05. RDY is displayed on ther interface.
2	Press Enter
3	Press the down arrow key until COM– is displayed. Then press Enter.
4	Press the down arrow key until CoAD (CANopen Address) is displayed. Then press Enter.
5	Using the arrow keys, configure the node number. Then press Esc.
6	Press the down arrow key until CoBD (CANopen Baud Rate) is displayed. Then press Enter.
7	Using the arrow keys, configure the baud rate (500). Then press Esc.
8	Press the Esc until RDY displayed.

Appendices

Overview

These appendices contain information that should be useful for programming the application.

What Is in This Appendix?

The appendix contains the following chapters:

Chapter	Chapter Name	Page
A	CANopen Master local object dictionary entry	277
B	Relation between PDOs and STB variables	293
C	Actions and transitions	297

CANopen Master local object dictionary entry

A

Subject of this chapter

This chapter contains the local object dictionary entry for CANopen Master.

What Is in This Chapter?

This chapter contains the following topics:

Topic	Page
Object Dictionary entries according Profile DS301	278
Object Dictionary entries according Profile DS302	283
Midrange Manufacturer Specific Object Dictionary Entries	285

Object Dictionary entries according Profile DS301

Object Dictionary entries

The table below presents the object dictionary entries according profile DS301.

Index (Hex)	Sub-index	Description	Object type	Data type	Comments
1000		Device Type	VAR	Unsigned32	0x000F 0191
1001		Error Register	VAR	Unsigned8	
1005		COB-ID SYNC	VAR	Unsigned32	
1006		Communication Cycle Period	VAR	Unsigned32	
1007		Synchronous Window Length	VAR	Unsigned32	
1008		Manufacturer Device Name	VAR	String	BMX CPU 20x0
1009		Manufacturer Hardware Version	VAR	String	MIDRANGE BASIC
100A		Manufacturer Sofware Version	VAR	String	COMM_FW_01_xx
1012		COB-ID Time Stamp Message	VAR	Unsigned32	
1016		Consumer Heartbeat Time	ARRAY		
	0	Number of entries : 64		Unsigned8	
	1	Consumer Heartbeat Time		Unsigned32	
	...			Unsigned32	
	64			Unsigned32	
1017		Producer Heartbeat Time	VAR	Unsigned16	
1018		Identity Object	RECORD		
	0	Number of entries		Unsigned8	4
	1	Vendor ID		Unsigned32	0x0600 005A
	2	Product Code		Unsigned32	0x3300 FFFF
	3	Revision Number		Unsigned32	0xyyyy xxxx
	4	Serial Number		Unsigned32	0x0
				Unsigned32	
1020		Verify Configuration	ARRAY		
	0	Number of entries : 2		Unsigned8	
	1	Configuration date		Unsigned32	
	2	Contiguration time		Unsigned32	
1200		1. Server SDO	RECORD		
	0	Number of entries		Unsigned8	
	1	COB-ID Client -> Server (Rx)		Unsigned32	600H + Node-ID

Index (Hex)	Sub-index	Description	Object type	Data type	Comments
	2	COB-ID Server -> Client (Tx)		Unsigned32	580H + Node-ID
1280		1. Client SDO	RECORD		
	0	Number of entries		Unsigned8	
	1	COB-ID Client -> Server (Rx)		Unsigned32	
	2	COB-ID Server -> Client (Tx)		Unsigned32	
	3	Node-ID of the Server SDO		Unsigned8	
1281		2. Client SDO	RECORD		
	0	Number of entries		Unsigned8	
	1	COB-ID Client -> Server (Rx)		Unsigned32	
	2	COB-ID Server -> Client (Tx)		Unsigned32	
	3	Node-ID of the Server SDO		Unsigned8	
1282		3. Client SDO	RECORD		
	0	Number of entries		Unsigned8	
	1	COB-ID Client -> Server (Rx)		Unsigned32	
	2	COB-ID Server -> Client (Tx)		Unsigned32	
	3	Node-ID of the Server SDO		Unsigned8	
1400		1. Receive PDO	RECORD		
	0	Largest sub-index supported		Unsigned8	
	1	COB-ID used by PDO		Unsigned32	
	2	Transmission type		Unsigned8	
	3			Unsigned16	
	4			Unsigned8	
	5	Event timer		Unsigned16	
1401		2. Receive PDO	RECORD		
	0	Largest sub-index supported		Unsigned8	
	1	COB-ID used by PDO		Unsigned32	
	2	Transmission type		Unsigned8	
	3			Unsigned16	
	4			Unsigned8	
	5	Event timer		Unsigned16	
.....					
14FF		256. Receive PDO	RECORD		
	0	Largest sub-index supported		Unsigned8	
	1	COB-ID used by PDO		Unsigned32	

Index (Hex)	Sub-index	Description	Object type	Data type	Comments
	2	Transmission type		Unsigned8	
	3			Unsigned16	
	4			Unsigned8	
	5	Event timer		Unsigned16	
1600		1. Receive PDO Mapping			
	0	Number of mapped application objects in PDO		Unsigned8	Depends on PDO mapping of the application
	1	PDO mapping for the 1. Application object to be mapped		Unsigned32	Index (16 bit) I Sub-index (8 bit) I length (8 bit)
	2	PDO mapping for the 2. Application object		Unsigned32	
	.....				
	8	PDO mapping for the 8. Application object		Unsigned32	
1601		2. Receive PDO Mapping			
	0	Number of mapped application objects in PDO		Unsigned8	Depends on PDO mapping of the application
	1	PDO mapping for the 1. Application object to be mapped		Unsigned32	Index (16 bit) I Sub-index (8 bit) I length (8 bit)
	2	PDO mapping for the 2. Application object		Unsigned32	
	.....				
	8	PDO mapping for the 8. Application object		Unsigned32	
.....					
16FF		256. Receive PDO Mapping			
	0	Number of mapped application objects in PDO		Unsigned8	Depends on PDO mapping of the application
	1	PDO mapping for the 1. Application object to be mapped		Unsigned32	Index (16 bit) I Sub-index (8 bit) I length (8 bit)
	2	PDO mapping for the 2. Application object		Unsigned32	
	.....				
	8	PDO mapping for the 8. Application object		Unsigned32	
1800		1. Transmit PDO	RECORD		
	0	Largest sub-index supported		Unsigned8	

Index (Hex)	Sub-index	Description	Object type	Data type	Comments
	1	COB-ID used by PDO		Unsigned32	
	2	Transmission type		Unsigned8	
	3	Inhibit time		Unsigned16	
	4	Reserved		Unsigned8	
	5	Event timer		Unsigned16	
1801		2. Transmit PDO	RECORD		
	0	Largest sub-index supported		Unsigned8	
	1	COB-ID used by PDO		Unsigned32	
	2	Transmission type		Unsigned8	
	3	Inhibit time		Unsigned16	
	4	Reserved		Unsigned8	
	5	Event timer		Unsigned16	
.....					
18FF		256. Transmit PDO	RECORD		
	0	Largest sub-index supported		Unsigned8	
	1	COB-ID used by PDO		Unsigned32	
	2	Transmission type		Unsigned8	
	3	Inhibit time		Unsigned16	
	4	Reserved		Unsigned8	
	5	Event timer		Unsigned16	
1A00		1. Transmit PDO Mapping			
	0	Number of mapped application objects in PDO		Unsigned8	Depends on PDO mapping of the application
	1	PDO mapping for the 1. Application object to be mapped		Unsigned32	Index (16 bit) I Sub-index (8 bit) I length (8 bit)
	2	PDO mapping for the 2. Application object		Unsigned32	
	.....				
	8	PDO mapping for the 8. Application object		Unsigned32	
1A01		2. Transmit PDO Mapping			
	0	Number of mapped application objects in PDO		Unsigned8	Depends on PDO mapping of the application
	1	PDO mapping for the 1. Application object to be mapped		Unsigned32	Index (16 bit) I Sub-index (8 bit) I length (8 bit)

Index (Hex)	Sub-index	Description	Object type	Data type	Comments
	2	PDO mapping for the 2. Application object		Unsigned32	
	.....				
	8	PDO mapping for the 8. Application object		Unsigned32	
.....					
1AFF		256. Transmit PDO Mapping			
	0	Number of mapped application objects in PDO		Unsigned8	Depends on PDO mapping of the application
	1	PDO mapping for the 1. Application object to be mapped		Unsigned32	Index (16 bit) I Sub-index (8 bit) I length (8 bit)
	2	PDO mapping for the 2. Application object		Unsigned32	
	.....				
	8	PDO mapping for the 8. Application object		Unsigned32	

Object Dictionary entries according Profile DS302

Object Dictionary entries

The table below presents the object dictionary entries according profile DS302.

Index (Hex)	Sub-index	Description	Object type	Data type	Comments
1F22		Concise DCF	ARRAY		
	0	Number of entries	VAR	Unsigned8	
	1	Device with Node-ID 1	VAR	DOMAIN	
	...				
	127	Device with Node-ID 127		DOMAIN	
1F26		Expected Configuration Date	ARRAY		
	0	Number of entries		Unsigned8	
	1	Device with Node-ID 1		Unsigned32	
	...				
	127	Device with Node-ID 127		Unsigned32	
1F27		Expected Configuration Time	ARRAY		
	0	Number of entries		Unsigned8	
	1	Device with Node-ID 1		Unsigned32	
	...				
	127	Device with Node-ID 127		Unsigned32	
1F80		NMT Startup	VAR	Unsigned32	
1F81	...	Slave Assignment	ARRAY		
	0	Number of entries		Unsigned8	
	1	Device with Node-ID 1		Unsigned32	
	...				
	127	Device with Node-ID 127		Unsigned32	
1F82	...	Request NMT	ARRAY		
	0	Number of entries		Unsigned8	
	1	Request NMT for Node-ID 1		Unsigned8	
	...				
	128	Request NMT for all Nodes		Unsigned8	
1F84	...	Device Type Identification	ARRAY		
	0	Number of entries		Unsigned8	
	1	Device with Node-ID 1		Unsigned32	
	...				

Index (Hex)	Sub-index	Description	Object type	Data type	Comments
	127	Device with Node-ID 127		Unsigned32	
1F85	...	Vendor Identification	ARRAY		
	0	Number of entries		Unsigned8	
	1	Device with Node-ID 1		Unsigned32	
	...				
	127	Device with Node-ID 127		Unsigned32	
1F86	...	Product Code	ARRAY		
	0	Number of entries		Unsigned8	
	1	Device with Node-ID 1		Unsigned32	
	...				
	127	Device with Node-ID 127		Unsigned32	
1F87	...	Revision Number	ARRAY		
	0	Number of entries		Unsigned8	
	1	Device with Node-ID 1		Unsigned32	
	...				
	127	Device with Node-ID 127		Unsigned32	

Midrange Manufacturer Specific Object Dictionary Entries

Project Data

The table below presents the Object Entry 2010 (Project Data).

Index (Hex)	Sub-index	Description	Object type	Data type	Comments
2010		Project Data	RECORD		
	0	Number of entries		Unsigned8	
	1	Current byte length		Unsigned16	Read only access Updated by the Master Manager
	2	Project data domain		DOMAIN	

CANopen Master Timing Control

The table below presents the Object Entry 2100 (CANopen Master Timing Control).

Index (Hex)	Sub-index	Description	Object type	Data type	Comments
2100		CANopen Master Timing Control	ARRAY		
	0	Number of entries		Unsigned8	
	1	Max. number of TPDOs to transmit during one cycle		Unsigned8	
	2	Max. number of high priority receive queue accesses during one cycle (RPDOs, EMCY)		Unsigned8	
	3	Max. number of low priority receive queue accesses during one cycle (SDOs, Heartbeat/Guarding)		Unsigned8	

CANopen Master Status

The table below presents the Object Entry 4100 (CANopen Master Status).

Index (Hex)	Sub-index	Description	Object type	Data type	Comments
4100		CANopen Master Status	ARRAY		
	0	Number of entries		Unsigned8	
	1	Global_events		Unsigned16	
	2	COMM_state		Unsigned8	
	3	COMM_diagnostic		Unsigned8	
	4	Config_bits		Unsigned16	
	5	LED_control		Unsigned16	
	6	Minimum Cycle Time		Unsigned8	
	7	Maximum Cycle Time		Unsigned8	

Nd_asg

The table below presents the Object Entry 4101 (Nd_asg).

Index (Hex)	Sub-index	Description	Object type	Data type	Comments
4101		Nd_asg	ARRAY		
	0	Number of entries		Unsigned8	
	1	Nd_asg[0,1,2,3		Unsigned32	
	2	Nd_asg[4,5,6,7		Unsigned32	
	3	Nd_asg[8,9,10,11		Unsigned32	
	4	Nd_asg[12,13,14,15		Unsigned32	

Nd_cfg

The table below presents the Object Entry 4102 (Nd_cfg).

Index (Hex)	Sub-index	Description	Object type	Data type	Comments
4102		Nd_cfg	ARRAY		
	0	Number of entries		Unsigned8	
	1	Nd_cfg[0,1,2,3		Unsigned32	
	2	Nd_cfg[4,5,6,7		Unsigned32	
	3	Nd_cfg[8,9,10,11		Unsigned32	
	4	Nd_cfg[12,13,14,15		Unsigned32	

Nd_asf

The table below presents the Object Entry 4103 (Nd_asf).

Index (Hex)	Sub-index	Description	Object type	Data type	Comments
4103		Nd_asf	ARRAY		
	0	Number of entries		Unsigned8	
	1	Nd_asf[0,1,2,3		Unsigned32	
	2	Nd_asf[4,5,6,7		Unsigned32	
	3	Nd_asf[8,9,10,11		Unsigned32	
	4	Nd_asf[12,13,14,15		Unsigned32	

Nd_oper

The table below presents the Object Entry 4104 (Nd_oper).

Index (Hex)	Sub-index	Description	Object type	Data type	Comments
4104		Nd_oper	ARRAY		
	0	Number of entries		Unsigned8	
	1	Nd_oper[0,1,2,3		Unsigned32	
	2	Nd_oper[4,5,6,7		Unsigned32	
	3	Nd_oper[8,9,10,11		Unsigned32	
	4	Nd_oper[12,13,14,15		Unsigned32	

Nd_stop

The table below presents the Object Entry 4105 (Nd_stop).

Index (Hex)	Sub-index	Description	Object type	Data type	Comments
4105		Nd_stop	ARRAY		
	0	Number of entries		Unsigned8	
	1	Nd_stop[0,1,2,3		Unsigned32	
	2	Nd_stop[4,5,6,7		Unsigned32	
	3	Nd_stop[8,9,10,11		Unsigned32	
	4	Nd_stop[12,13,14,15		Unsigned32	

Nd_preop

The table below presents the Object Entry 4106 (Nd_preop).

Index (Hex)	Sub-index	Description	Object type	Data type	Comments
4106		Nd_preop	ARRAY		
	0	Number of entries		Unsigned8	
	1	Nd_preop[0,1,2,3		Unsigned32	
	2	Nd_preop[4,5,6,7		Unsigned32	
	3	Nd_preop[8,9,10,11		Unsigned32	
	4	Nd_preop[12,13,14,15		Unsigned32	

Nd_err

The table below presents the Object Entry 4107 (Nd_err).

Index (Hex)	Sub-index	Description	Object type	Data type	Comments
4107		Nd_err	ARRAY		
	0	Number of entries		Unsigned8	
	1	Nd_err[0,1,2,3		Unsigned32	
	2	Nd_err[4,5,6,7		Unsigned32	
	3	Nd_err[8,9,10,11		Unsigned32	
	4	Nd_err[12,13,14,15		Unsigned32	

Node Error Count

The table below presents the Object Entry 4110 (Node Error Count).

Index (Hex)	Sub-index	Description	Object type	Data type	Comments
4110		Node Error Count	ARRAY		
	0	Number of entries		Unsigned8	
	1	Number of the received emergency messages of node number 1		Unsigned8	
	...				
	127	Number of the received emergency messages of node number 127		Unsigned8	

Error Code Specific Error Counters

The table below presents the Object Entries 4111 to 4117 (Error Code Specific Error Counters).

Index (Hex)	Sub-index	Description	Object type	Data type	Comments
4111		Generic_error_count (Code 10xxH)	VAR	Unsigned8	
4112		Device_hardware_error_count (Code 50xxH)	VAR	Unsigned8	
4113		Device_software_error_count (Code 60xxH)	VAR	Unsigned8	
4114		Communication_error_count (Code 81xxH)	VAR	Unsigned8	
4115		Protocol_error_count (Code 82xxH)	VAR	Unsigned8	
4116		External_error_count (Code 90xxH)	VAR	Unsigned8	
4117		Device_specific (Code FFxxH)	VAR	Unsigned8	

Emergency History

The table below presents the Object Entry 4118 (Emergency History).

Index (Hex)	Sub-index	Description	Object type	Data type	Comments
4118		Emergency History	ARRAY		
	0	Number of entries		Unsigned8	
	1	Emergency history of node number 1		Domain	
	...				
	127	Emergency history of node number 127		Domain	

input Process Image

The table below presents the Object Entry 4200 (Input Process Image).

Index (Hex)	Sub-index	Description	Object type	Data type	Comments
4200		Input Process Image	RECORD		
	0	Number of entries		Unsigned8	
	1	Current byte length		Unsigned16	Read only access Updated by the Master Manager

Output Process Image

The table below presents the Object Entry 4201 (Output Process Image).

Index (Hex)	Sub-index	Description	Object type	Data type	Comments
4201		Output Process Image	RECORD		
	0	Number of entries		Unsigned8	
	1	Current byte length		Unsigned16	Read only access Updated by the Master Manager

Additional Master Information

The table below presents the Object Entry 4205 (Additional Master Information).

Index (Hex)	Sub-index	Description	Object type	Data type	Comments
4205		Additional Master Information	RECORD		
	0	Number of entries		Unsigned8	ro
	1	Coupler (CPU) type		Unsigned8	rw
	2	CAN baudrate table index		Unsigned8	ro
	3	Highest used Node-ID		Unsigned8	ro
	4	Number of used RxPDOs		Unsigned16	ro
	5	Number of used TxPDOs		Unsigned16	ro
	6	Number of mapped objects PI input		Unsigned16	ro
	7	Number of mapped objects PI output		Unsigned16	ro
	8	Covered bytes by the concise DCF		Unsigned8	ro
	9	Byte size of the concise DCF buffer		Unsigned16	ro
	10	Configuration signature		Unsigned16	rw
	11	Control		Unsigned16	rw

Access type : ro (read only), rw (read / write)

Additional Slave Assignment

The table below presents the Object Entry 4250 (Additional Slave Assignment).

Index (Hex)	Sub-index	Description	Object type	Data type	Comments
4250		Additional Slave Assignment	ARRAY		
	0	Number of entries		Unsigned8	
	1	Boot behaviour for Node-ID 1		Unsigned8	
	...				
	127	Boot behaviour for Node-ID 127		Unsigned8	

Bit 0 = 0 : Bootup according DS-302

Bit 1 = 1 : Bootup do not overwrite config parameter

Relation between PDOs and STB variables

B

STB island configuration

At a glance

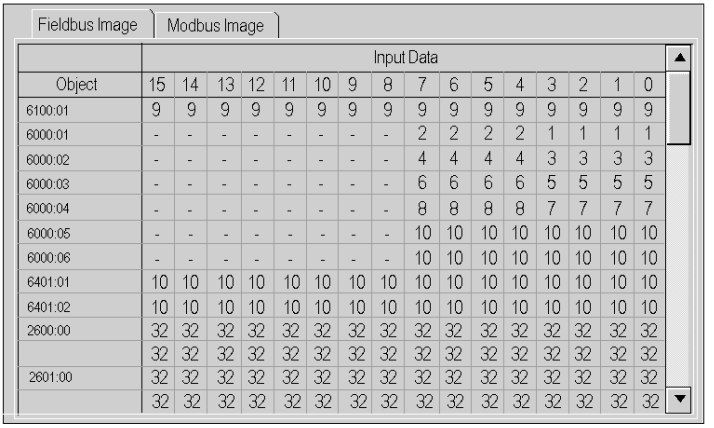
STB islands can be configured:

- using Advantys Configuration Software (STB NCO 2212),
- using Unity Pro Software (STB NCO 2212 and NCO 1010).

Configuration using Advantys Configuration Island

The procedure for configuring a STB island using Advantys Configuration Software is as follow. It only concerns the STB NCO 2212 module:

Step	Action
1	In Advantys Configuration Software (Version 2.2.0.2 or above), create a new island
2	Select the STBNCO2212 Network Interface Module
3	Select the modules which will be used in the application

Step	Action
4	In the menu click on `Island` and on `I/O image overview`  This window represents an I/O image overwiev while offline. The variable indexes are the same as for Unity Pro Software. It allows to find the content of PDO quickly and easily.
5	When the configuration is over, click on File/Export to export the island in DCF format, which will be imported in Unity Pro.

Fieldbus Image | Modbus Image

	Input Data															
Object	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
6100:01	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9
6000:01	-	-	-	-	-	-	-	-	2	2	2	2	1	1	1	1
6000:02	-	-	-	-	-	-	-	-	4	4	4	4	3	3	3	3
6000:03	-	-	-	-	-	-	-	-	6	6	6	6	5	5	5	5
6000:04	-	-	-	-	-	-	-	-	8	8	8	8	7	7	7	7
6000:05	-	-	-	-	-	-	-	-	10	10	10	10	10	10	10	10
6000:06	-	-	-	-	-	-	-	-	10	10	10	10	10	10	10	10
6401:01	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10
6401:02	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10
2600:00	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32
	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32
2601:00	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32
	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32

⚠ WARNING

UNINTENDED EQUIPMENT OPERATION

The symbol file ***.xsy** generated by Advantys must not be used in Unity Pro during the configuration of an STB Island.

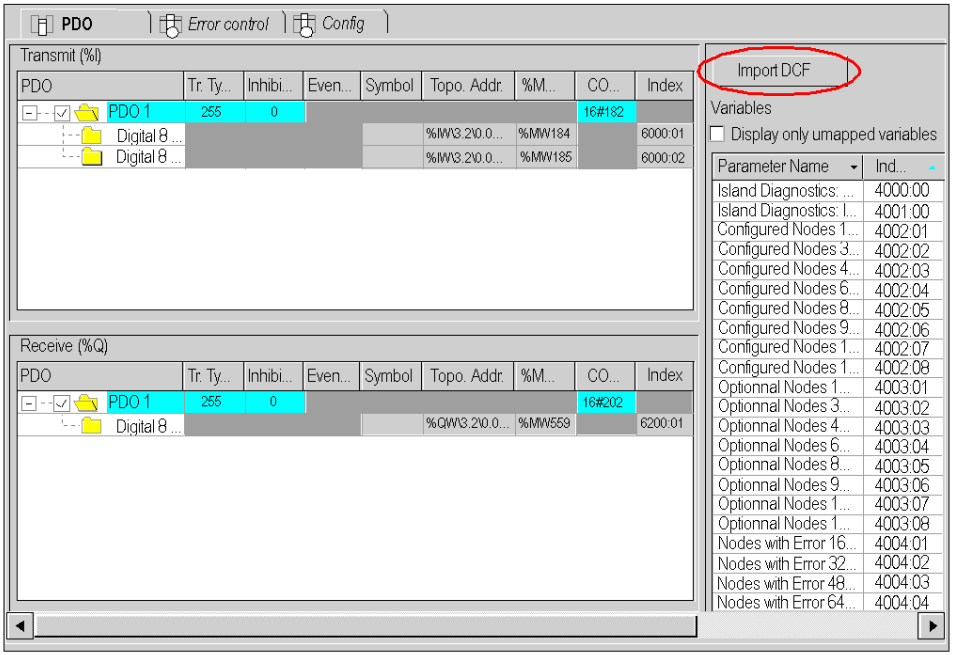
CANopen devices are not supported during ***.xsy** file import.

The %MW objects that are assigned in the PDO table are not in the same range as those defined in the configuration for the CANopen head.

Failure to follow these instructions can result in death, serious injury, or equipment damage.

Configuration using Unity Pro Software

The procedure to configure a STB island using Unity Pro Software is as follow:

Step	Action
1	In the `Project browser`, double-click on `Configuration` then `3:CANopen`.
2	In the `CANopen` window, double-click on the Advantys STB representation. The STB configuration window opens
3	In `Function` zone, select `Advanced`.
4	Click on the PDO tab to see the PDO configuration, the variables and their topological addresses. 
5	On the right side of the window, there is the list of STB mapped or unmapped variables. The indexes are the same as Advantys Configuration Software. Variables can be found quickly and easily. Drag and drop the variables to the right PDO to configure the STB island. **NOTE:** It is possible to import the DCF file by clicking on the Import DCF button

Actions and transitions

C

Subject of this chapter

This chapter contains the actions and the transitions used in the grafcet (See *Creating the program in SFC for managing the move sequence, page 252*)

What Is in This Chapter?

This chapter contains the following topics:

Topic	Page
Transitions	298
Actions	299

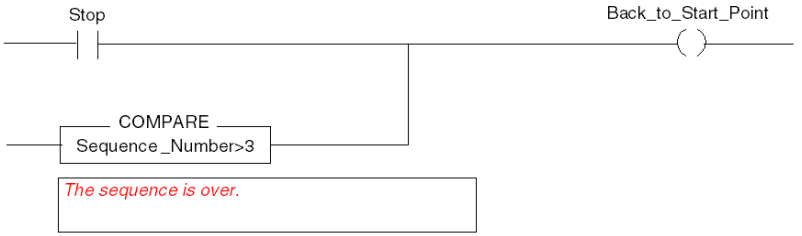
Transitions

At a glance

The next tasks, written in LD, are used in different transitions of the grafcet.

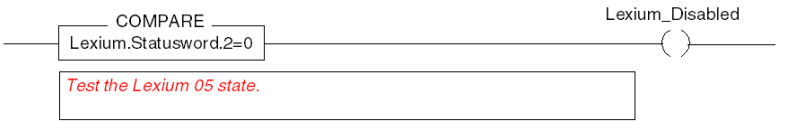
Back_to_Start_Point transition

The action associated to the **Back_to_Start_Point** transition is as follows:



Lexium_Disabled transition

The action associated to the **Lexium_Disabled** transition is as follows:



Actions

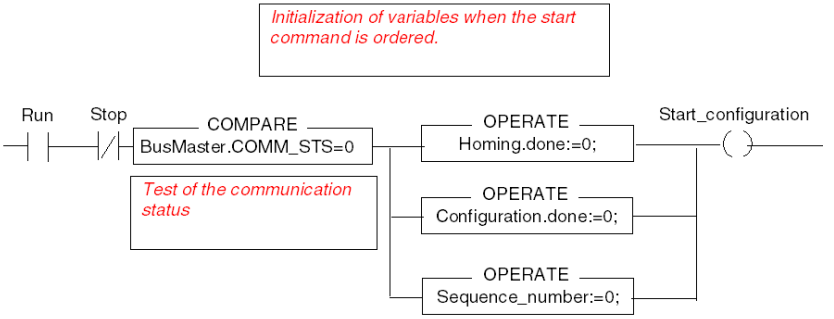
At a glance

The next tasks, written in LD and ST are used in different steps of the grafcet.

NOTE: To use the following actions, in `Tools/Project Setting/Languages extension`, select `Allow dynamic arrays` and `Directly represented array variables` options.

Init step

The action associated to the **Init** step is as follows:



Move_to_Next_Position step

Two actions are associated to the **Move_to_Next_Position** step.

The first action is as follows:

```
(* Definition of the target position*)
CASE Sequence_number OF
  1: Lexium.Target_Position:=Position_B;
  2: Lexium.Target_Position:=Position_A;
  3: Lexium.Target_Position:=Position_C;
END_CASE;
IF (Sequence_number<4) AND NOT (Stop) THEN
(* Start the new positionning *)
 New_SetPoint:=1;
 Ready_for_Stop:=0;
END IF;
```

The second action is as follows:

```
(*Incrementation before new move starts*)
INC(Sequence_Number);
```

NOTE: For the incrementation action, the qualifier must be positionned on P (rising edge).

Return_to_Start_Point step

The action associated to the **Return_to_Start_Point** step is as follows:

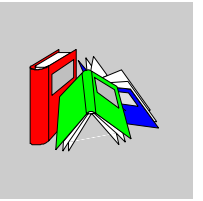
```
(*Target Position Loading*)
Lexium.Target_Position:=0;
(*Start a new positioning*)
New_Setpoint:=1;
```

Disable_Lexium

The action associated to the **Disable_Lexium** step is as follows:

```
(*Lexium voltage disabling*)
Lexium.Controlword:=Lexium_disabling;
```

Glossary



A

ADVANTYS

Schneider CANopen Configuration tool for PLC islands.

B

BOOL

Boolean.

C

CAN

Controller **A**rea **N**etwork : field bus originally developed for automobile applications and now used in many sectors.

CiA

CAN **i**n **A**utomation : international organization of users and manufacturers of CAN devices.

COB

Communication Object: transport unit on CANopen bus. A COB is identified by a unique identifier, which is coded on 11 bits, [0, 2047]. A COB contains a maximum of 8 data bytes. The transmission priority of a COB is given by its identifier. The weaker the identifier, the more the associated COB is priority.

COB-ID

COB Identifier : unique identifier of a COB on a CANopen network. The identifier determines the priority of a COB.

CSDO

SDO Client

D

DINT

Double integer : 32 bit word.

Discrete Module

Tout **O**u **R**ien.

DS

Draft Standard: specifications document created by the CIA organization.

E

EBOOL

Boolean with edge detection and forcing possibilities.

EDM

Multi-language Electronic Data Sheet : extended version of EDS file. Extensions include European multilingual support as well as a description of physical characteristics of a device.

EDS

Electronic Data Sheet: Description of a CANopen device profile description normalized by the DSP306 CiA specification.

EMCY

Emergency : A trigger event, generated by an internal error/fault. This object is transmitted with each new error, since error codes are independent mechanisms.

ETS

Empty Terminal Support : Additional information is stored in the PLC application for uploading.

H

HEALTH

bit from 1 : Mode functions correctly

bit from 0 :

- Bad configuration, or,
- Module configured but absent, or;
- module already configures, but with the same address as an existing module, or
- No Communication

I

INT

Integer : Integer 16 bit word.

IODDT

Input/**O**utput **D**erived **D**ata **T**ype

M

Mapping

Transformation of data consigned in a special and different format.

N

NIM

Network Interface Module : Communication between the device and field bus.

NMT

Network Management : This is responsible for managing the execution, configuration and errors in a CAN network.

P

PDO

Process Data Object: object for data exchange between different elements is CAN open.

PROCESS IMAGE

Part of the system memory where the E/S values are stored from PDO exchanges on the CANopen bus. This section is managed by the CANopen stack.

The inputs are copied in the user application memory at the start of each task cycle and the outputs at the end of each task cycle.

R

REAL

Real number.

RPDO

Received PDO

S

SDO

Service Data Object: peer to peer communication with access to Dictionary Object of a CANopen bus element.

SSDO

SDO Server

STB

Small **T**erminal **B**lock.

SYNC

Synchronisation Object

T

TPDO

PDO Transmission

U

UDINT

Unsigned double integer : Unsigned double integer

UINT

Unsigned integer : Unsigned integer

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